BRITISH COLUMBIA SEABIRD COLONY INVENTORY: REPORT #7: NORTHERN MAINLAND COAST

Michael S. Rodway
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ABSTRACT

The Canadian Wildlife Service conducted detailed inventories of seabird colonies along the northern mainland coast in 1983, 1987 and 1988 as part of the British Columbia Seabird Colony Inventory Program. All colonies of burrow-nesting species were surveyed. A few small gull colonies were not visited. Total or partial counts were made for surface-nesting species and small colonies of burrow nesters. Burrow densities on larger storm-petrel and alcid colonies were estimated using systematic sampling along strip transects or within quadrats surveyed along line transects. Burrow occupancy rates were not obtained at small storm-petrel and alcid colonies, and population estimates were based on median occupancy rates at other colonies in the province.

The region supports a breeding population of about 390,000 birds. Rhinoceros Auklets (Cerorhinca monocerata) are the most abundant nesting species, comprising 60% of the total nesting population. Fork-tailed Storm-Petrels (Oceanodroma furcata), Leach's Storm-Petrels (O. leucorhoa) and Cassin's Auklets (Ptychoramphus aleuticus) compose another 38%. Ninety-eight percent of the nesting birds are concentrated in two clusters of colonies. Islands off the west coast of Aristazabal Island in the vicinity of the Moore Islands support over 332,000 birds (85%), and Lucy and Rachael islands in central Chatham Sound support almost 52,000 birds (13%). Most of the birds nesting in the region could be endangered by local environmental contamination in proximity to those concentrations. The status of Marbled Murrelets (Brachyramphus marmoratus), which are assumed to breed in the region, is unknown.

RÉSUMÉ

Dans le cadre du Programme d'inventaire des oiseaux marins de la Colombie-Britannique, le Service canadien de la faune a effectué, en 1983, 1987 et 1988, des dénombrements détaillés des colonies d'oiseaux marins fréquentant la côte. On a fait des dénombrements partiels ou complets des espèces nichant en surface et des petites colonies nichant dans des terriers. Pour évaluer la population des terriers des colonies les plus importantes de pétrels tempête et d'alcidés, on a fait un échantillonage systématique soit en dénombrant des transects on soit en échantillonment des quadrats placées le long de lignes de transects. Les taux d'occupation des terriers de colonies de pétrels tempête et d'alcidés n'ont pas été estimé; les évaluations de ces populations sont basées sur la moyenne des taux d'occupation d'autres colonies de la province.

On estime qu'il y a environ 390 000 oiseaux marins qui nichent dans la région. Le macareux cornu (Cerorhinca monocerata) est l'espèce la plus abondante (60%). Le pétrel à queue fourchue (Oceanodroma furcata), le pétrel cul-blanc (O. leucorhoa) et l'alque de cassin (Ptychoramphus aleuticus) constituent 38% de la population. Les populations sont concentrées à 98% dans deux colonies: la première au large de la côte ouest de l'île Aristazabal, aux environs des îles Moore (332 000 oiseaux, soit 85% de l'ensemble), et la deuxième dans les îles Lucy et Rachael du détroit de Chatham (52 000 oiseaux, soit 13% de l'ensemble). La plupart des oiseaux qui nichent dans la région sont menacés par la contamination du milieu environnant. On ne connaît pas la situation des alques marbrées (Brachyramphus marmoratus) qui nichent dans la région.

TABLE OF CONTENTS

ABSTRACT i

RÉSUMÉ i

TABLE OF CONTENTS iii

LIST OF TABLES v

LIST OF FIGURES ix

LIST OF APPENDICES x

ACKNOWLEDGEMENTS xi

INTRODUCTION 1

METHODS 3

COLONY ACCOUNTS 10

MC-030 GREY ISLAND 10

MC-040 GREEN ISLAND 11

MC-070 "BARON" CLIFFS 12

MC-080 CONNEL ISLANDS 14

MC-090 "SIMPSON" ROCKS 16

MC-100 LUCY ISLANDS 17

MC-110 TREE KNOB GROUP 22

MC-120 ROLAND ROCKS 27

MC-130 RACHAEL ISLANDS 28

MC-160 GULL ROCKS 33

MC-170 LAWYER ISLANDS 33

MC-200 JOSEPH ISLAND 35

MC-210 MacDONALD ISLAND 37

MC-220 "PORTER" ROCKS 38

TABLE OF CONTENTS (cont'd)

MC-230 GLIDE ISLANDS 39
MC-240 DUPONT ISLAND 40
MC-260 ANDERSON ISLANDS 41
MC-270 WELLS ROCKS 43
MC-280 ISNOR ROCK 45
MC-290 MOORE ISLANDS 46
MC-300 McKENNEY ISLANDS 62
MC-310 WHITMORE ISLANDS 68
MC-320 "LONE" ROCK 74
MC-330 BOWDEN ISLANDS 75
MC-340 BYERS ISLANDS 77
MC-350 SINNETT ISLETS 90
MC-360 CONROY ISLAND 97
MC-370 HARVEY ISLANDS 102
MC-380 ROGERSON ROCK 108
MC-390 STEELE ROCK 109
MC-400 "PRICE" ROCKS 110
MC-410 "LIMIT" ROCKS 112
MC-420 FINGAL ISLAND 113
MC-430 GUANO ROCKS 115
MC-440 "FITZMELON" ROCK 116
MC-450 GOOSE ISLAND 116
MC-460 GOSLING ROCKS 122
MC-470 CURRIE ISLET 126
MC-490 "TRIQUET" ROCKS 127

TABLE OF CONTENTS (cont'd)

MC-500 BLENHEIM ISLAND 128

MC-510 AIRACOBRA ROCK 130

MC-520 NORTH POINTERS 130

MC-530 UPWARD ROCK 132

MC-540 MAJOR BROWN ROCK 133

MC-550 DUGOUT ROCKS 135

MC-560 RUBY ROCKS 136

MC-590 EGG ISLAND 138

MC-600 EGG ROCKS 139

ISLANDS SURVEYED WITH NO HISTORY OF NESTING BY SEABIRDS . . 141

SUMMARY AND CONCLUSIONS 173

METHODOLOGICAL CONSIDERATIONS AND RECOMMENDATIONS 177

LITERATURE CITED 178

LIST OF TABLES

MC030-1. Glaucous-winged Gull nests on Grey Island in 1988 10

MC040-1. Glaucous-winged Gull nests on Green Island in 1988 11

MC090-1. Glaucous-winged Gull nests on "Simpson" Rocks in 1988 16

MC100-1. Glaucous-winged Gull nests on Lucy Islands in 1984 19

MC100-2. Glaucous-winged Gull nests on Lucy Islands in 1988 19

LIST OF TABLES (cont'd)

MC100-3. Number of Rhinoceros Auklet burrows in 2x2 m plots (islands A and C) and 3x3 m plots (island D) on Lucy Islands in 1983 21

MC110-1. Pelagic Cormorant nests on the Tree Knob Group in 1988 23

MC110-2. Glaucous-winged Gull nests on the Tree Knob Group in 1988 25

MC120-1. Glaucous-winged Gull nests on Roland Rocks in 1988 27

MC130-1. Glaucous-winged Gull nests on Rachael Islands in 1988 30

MC130-2. Numbers of Rhinoceros Auklet burrows counted around Rachael Islands in 1987 31

MC200-1. Glaucous-winged Gull nests on Joseph Rock in 1988 36

MC270-1. Glaucous-winged Gull nests on Wells Rocks in 1988 44

MC290-1. Number of storm-petrel burrows in 2x2 m plots along transects on the west islets of the Moore Islands in 1988 50

MC290-2. Occupancy of storm-petrel burrows on the west islets of the Moore Islands on 4 June 1988 50

MC290-3. Black Oystercatcher nests on Moore Islands in 1988 51

MC290-4. Glaucous-winged Gull nests on Moore Islands in 1988 52

MC290-5. Pigeon Guillemots counted around the Moore Islands in 1988 53

MC290-6. Number of Rhinoceros Auklet burrows in 5 m sections along 2 m wide transects on the main islands of the Moore Islands in 1988 55

MC290-7. Number of Rhinoceros Auklet burrows in 2x2 m plots along transects on the west islets of the Moore Islands in 1988 59

MC300-1. Number of storm-petrel burrows in 2x2 m plots along transects on McKenney Islands in 1988 65

LIST OF TABLES (cont'd)

MC300-2. Glaucous-winged Gull nests on McKenney Islands in 1988 66

MC310-1. Glaucous-winged Gull nests on Whitmore Islands in 1988 71

MC310-2. Number of Rhinoceros Auklet burrows in 5 m sections along 2 m wide strip transects on the main islands of the Whitmore Islands in 1988 73

MC320-1. Glaucous-winged Gull nests on "Lone" Rock in 1988 75

MC340-1. Transect parameters on Byers Islands in 1988. . . 79

MC340-2. Black Oystercatcher nests on Byers Islands in 1988 80

MC340-3. Glaucous-winged Gull nests on Byers Islands in 1988 81

MC340-4. Pigeon Guillemots counted around Byers Islands in 1988 81

MC340-5. Extent of Cassin's Auklet and Rhinoceros Auklet colony along transects on Byers Islands in 1988 . . . 83

MC340-6. Number of Cassin's Auklet burrows in 2x2 m plots along transects on Byers Islands in 1988 84

MC340-7. Habitat locations of Cassin's Auklet and Rhinoceros Auklet burrow entrances along transects on Byers Islands in 1988 84

MC340-8. Occupancy of Cassin's Auklet and Rhinoceros Auklet burrows on Byers Islands in 1988 85

MC340-9. Number of Rhinoceros Auklet burrows in 2x2 m plots along transects on Byers Islands in 1988 86

MC350-1. Number of storm-petrel burrows in 2x2 m plots along transects on Sinnett Islets in 1988 93

MC350-2. Habitat locations of storm-petrel burrow entrances along transects on Sinnett Islets in 1988 93

MC350-3. Occupancy of storm-petrel burrows on Sinnett Islets on 19 June 1988 94

LIST OF TABLES (cont'd)

MC350-4. Black Oystercatcher nests on Sinnett Islets in 1988 94

MC350-5. Glaucous-winged Gull nests on Sinnett Islets in 1988 95

MC350-6. Number of Cassin's Auklet burrows in 2x2 m plots along transects on Sinnett Islets in 1988 96

MC360-1. Black Oystercatcher nests on Conroy Island in 1988 98

MC360-2. Glaucous-winged Gull nests on Conroy Island in 1988 100

MC370-1. Black Oystercatcher nests on Harvey Islands in 1988 103

MC370-2. Glaucous-winged Gull nests on Harvey Islands in 1988 105

MC370-3. Numbers of Cassin's Auklet and Rhinoceros Auklet burrows counted and estimated on Harvey Islands in 1988 106

MC380-1. Glaucous-winged Gull nests on Rogerson Rock in 1988 108

MC400-1. Glaucous-winged Gull nests on "Price" Rocks in 1988 111

MC420-1. Glaucous-winged Gull nests on Fingal Island in 1988 114

MC430-1. Glaucous-winged Gull nests on Guano Rocks in 1988 115

MC460-1. Black Oystercatcher nests on Gosling Rocks in 1988 122

MC460-2. Glaucous-winged Gull nests on Gosling Rocks in 1988 124

MC460-3. Pigeon Guillemot nests and birds on Gosling Rocks in 1988 124

MC470-1. Glaucous-winged Gull nests on Currie Islet in 1988 126

LIST OF TABLES (cont'd)

MC500-1. Glaucous-winged Gull nests on Blenheim Island in 1988 129

MC520-1. Glaucous-winged Gull nests on North Pointers in 1988 131

MC530-1. Glaucous-winged Gull nests on Upward Rock in 1988 132

MC540-1. Glaucous-winged Gull nests on Major Brown Rock in 1988 134

MC550-1. Glaucous-winged Gull nests on Dugout Rocks in 1988 136

MC560-1. Glaucous-winged Gull nests on Ruby Rocks in 1988 137

MC600-1. Glaucous-winged Gull nests on Egg Rocks in 1988 . 140

MC-1. Current summary of breeding seabird populations on the Northern Mainland Coast 175

LIST OF FIGURES

MC-1. Seabird colonies on the Northern Mainland Coast 2

MC070/080-1. Seabird nesting areas on "Baron" Cliffs and Connel Islands in 1987 13

MC100-1. Seabird colony areas on Lucy Islands in 1983 . . . 18

MC110-1. Seabird nesting areas on the Tree Knob Group in 1988 24

MC130-1. Seabird nesting areas on Rachael Islands in 1987 and 1988 29

MC290-1. Seabird colony areas and transect locations on the main Moore Islands in 1988 47

MC290-2. Seabird colony areas and transect locations on the western islets of the Moore Islands in 1988 48

MC300-1. Seabird colony areas and transect locations on McKenney Islands in 1988 64

LIST OF FIGURES (cont'd)

MC310-1. Seabird colony areas and transect locations on Whitmore Islands in 1988 69

MC340-1. Seabird colony areas and transect locations on Byers Islands in 1988 78

MC350-1. Seabird colony areas and transect locations on Sinnett Islets in 1988 92

MC360-1. Seabird colony areas on Conroy Island in 1988 . . 99

MC370-1. Seabird colony areas on Harvey Islands in 1988 . 104

MC450-1. Seabird nesting areas on Goose Island in 1988 . . 118

MC460-1. Seabird nesting areas on Gosling Rocks in 1988 . 123

LIST OF APPENDICES

I. Index to species names and acronyms 180

ACKNOWLEDGEMENTS

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Permission to work on Provincial Ecological Reserves was granted by L. Goulet.

INTRODUCTION

Of the hundreds of islands along the mainland coast between the Alaska border and Cape Caution, only 59 support nesting seabirds (Rodway *et al*. in prep; Fig. MC-1). The presence of mink on most islands likely limits the distribution of nesting seabirds. Nine species are currently known to nest, and two others may nest. A single pair of Ancient Murrelets were discovered nesting in the Moore Islands in 1970 (BCNRS), but have not been observed since, and one pair of Horned Puffins was suspected nesting off Conroy Island in 1988. Rhinoceros Auklets (*Cerorhinca monocerata*) are the most abundant nesting species, comprising 60% of the total nesting population of about 390,000 birds (Rodway *in press*; Table MC-1). Fork-tailed Storm-Petrels (*Oceanodroma furcata*), Leach's Storm-Petrels (*O. leucorhoa*) and Cassin's Auklets (*Ptychoramphus aleuticus*) compose another 38%. Ninety-eight percent of the nesting birds are concentrated in two clusters of colonies. Islands off the west coast of Aristazabal Island in the vicinity of the Moore Islands support over 332,000 birds (85%), and Lucy and Rachael Islands in central Chatham Sound support almost 52,000 birds (13%). These concentrations make most of the birds nesting in the region particularly vulnerable to oil spills or other environmental contamination.

Surveys by the British Columbia Provincial Museum (now Royal B.C. Museum) in 1976 and 1977 (TERA Environmental Resource Analyst Ltd. 1977; Summers and Campbell 1978; BCNRS) identified most colony locations in the region, made total counts of surface nesting species, and made cursory population estimates of burrow nesting species. Except for surface nesting species, those estimates could not be used to determine changes or monitor trends. During 1983, 1987 and 1988, the Canadian Wildlife Service completed detailed inventories of colonies along the northern mainland coast. All colonies of burrow-nesting species were surveyed. A few small gull colonies were not visited. Census results from 1976 for those small colonies (Summers and Campbell 1978; BCNRS) have been included in the population summary (Table MC-1) to provide a total estimate of seabird breeding populations in the region. All other bird and mammal species sighted around colonies and other islands explored have been listed with each island account.

Most of the cluster of major colonies off the west coast of Aristazabal Island are protected as B.C. Ecological Reserves. Reserve No. 23, established in 1971, includes the southern Moore Islands (the north island is an Indian Reserve), McKenney Islands and Whitmore Islands, and Reserve No. 103, established in 1981, includes Byers Islands, Conroy Island, Harvey Islands, Sinnett Islets, and "Lone" Rock. Further north, MacDonald Island, "Porter" Rocks and Glide Islands are part of Reserve No. 25, established in 1971.

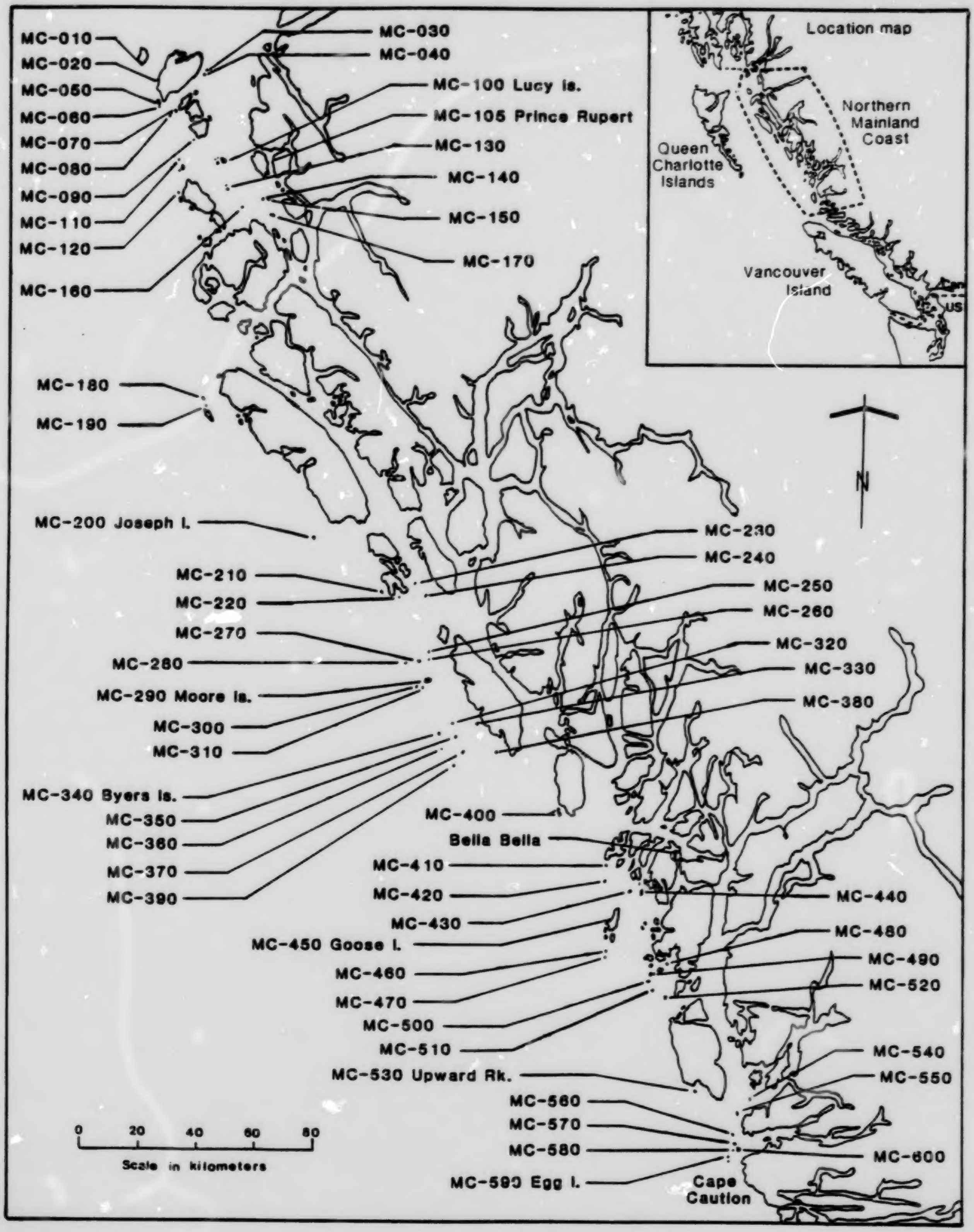

Figure MC-1. Seabird colonies on the Northern Mainland Coast.

Breeding distribution and populations of Marbled Murrelets (Brachyramphus marmoratus), which likely nest in this region, are unknown. Special survey methodology will be required to address the unique conservation problems presented by this species (Sealy and Carter 1984; Rodway 1990).

METHODS

Census methods were selected according to the area, habitat, and species of birds nesting on an island (Nettleship 1976). All islands were first explored to determine if nesting occurred. Small islands were completely examined. On large islands the entire perimeter was explored to a distance of 50 m from shore, plus frequent sections of the interior up to 200 m from shore. If no nesting seabirds were found no further searching was undertaken. If nesting was encountered exploration was continued to determine colony boundaries and the appropriate census technique.

1. Total Count. Total nest counts were made for Pelagic Cormorants (Phalacrocorax pelagicus), Black Oystercatchers (Haematopus bachmani) and Glaucous-winged Gulls (Larus glaucescens), unless nests were inaccessible. Population estimates equal the number of nests counted. For burrowing species, total counts were made when all burrows were accessible and easily tallied during the exploration of the island. This method was appropriate on small islands with few burrows, or on larger islands with scattered burrows around perimeter areas. Population estimates equal the number of burrows counted multiplied by the median occupancy rate (Rodway et al. 1988), rounded to the nearest ten. Nesting populations are estimated differently for surface and burrow nesting species because surface nests are constructed each year and represent a current reproductive effort, whereas burrows can persist for a number of years even when not being used. Within the text, lists of nests counted use these abbreviations: Sta - start; Emp - empty; E - egg; Y - young.

Total numbers of Pigeon Guillemots (Cepphus columba) sighted around colonies were counted, but no standardized observation techniques were employed (see Nettleship 1976), and no attempt was made to estimate actual nesting populations.

2. Partial Count. On small islands where a total count was not feasible or practical, but the colony area or population was too small to warrant sampling by transects, burrows in representative portions of the island were counted and figures were extrapolated for the rest of the area.

3. Strip Transects. These were used on Rhinoceros Auklet colonies on Moore and Whitmore islands where the colonies were too narrow to sample effectively with quadrats along line transects. Measured strips, 2 m wide, were run across the colony area, perpendicular to

shore, and all burrows were counted within them to give an estimate of the overall density of burrows. Transects were spaced 200 m apart. Occupancy rate and total population were calculated as described below under line transects. Colony area was calculated by measuring the perimeter of the island where colony occurred, and multiplying it by the average width of burrowing as determined along strip transects. This allowed us to calculate a standard error for the area estimate.

4. Line Transects With Quadrats.

4.1. **Transect location.** After the colony was mapped during exploration, equally spaced transects were run throughout colony areas. In areas where the coastline was straight, transects were laid out upslope, generally perpendicular to the shoreline. On smaller islands, or around points or bays of large islands, where the coastline was concave or convex, transects were laid out along parallel bearings to avoid convergence or divergence inland. Such transects were run across the long axis of an island or point, to insure representative sampling of variations in species distribution and burrow density. Transect spacing ranged from 75 m to 200 m apart, depending on the size of the colony. We attempted to sample 1% of the area of a colony. That value was the maximum sampling effort we found possible within a practical time frame. Transects were placed half a "spacing" distance from the borders of a colony, and unless the colony edge was at the island shore, a transect was run outside the edge to insure that our mapping was accurate, and to provide a sample of "non-colony" so that changes in colony extent could be reliably interpreted on future surveys. Transects were located either by measuring the spacing distance along a line perpendicular to the transect bearings (along the shore if this was feasible), or by locating reference points plotted on air photos (for areas where the topography was extremely dissected or impassable).

4.2. **Quadrats:** On all colonies except Lucy Islands, 2x2 m quadrats were set at 15 m intervals along transect lines, with the first quadrat at the shore edge of the vegetation, unless that was inaccessible, and the last placed beyond the interior extent of the colony. On Lucy Islands, both 2x2 m and 3x3 m quadrats were used, spaced 6 m apart.

Burrows were counted within each quadrat to determine burrow density. Burrow characteristics were recorded: location (ie, under roots, stumps, logs, grass tussocks, etc.), accessibility (whether it was obscured, or obstructed), and signs of activity (droppings, feathers, etc.), both at the entrance and in the tunnel. If within one arm's length, entrances connected into the same tunnel, only one burrow was recorded and the number of entrances was noted. Habitat parameters were measured: distance from shore, altitude, slope, percent and species composition of ground cover, shrub cover, and forest canopy. To place the quadrat in the context of the overall habitat, tree species, percent composition, and average size (dbh), and general terrain features were documented for the area surrounding each quadrat within a radius equal to half the distance between quadrats. Evidence of predation (eggshells, carcasses, feather piles) within each quadrat was recorded, and the overall density of predation evidence was calculated in the same fashion as burrow density.

4.3. **Colony area:** Colony area was defined to include all portions of an island where burrows with recent signs of activity (droppings, feathers, regurgitated food, fragments of eggshell or egg membrane, worn entrances or tunnels, excavation, or fresh nesting material) were located. If burrows were located, but no signs of recent activity were observed in an area, the colony was considered abandoned. If there were no burrows within a quadrat, the surrounding area was searched for colony evidence to determine if the plot fell within the colony and should be used in density calculations. If no burrows were found within a distance halfway to adjacent quadrats along the transect, nor within a lateral radius half the distance to adjacent transects, then that area was excluded from the colony and the plot data was not used in density calculations. If burrows and signs of activity did occur within this range, then the area was considered colony and the plot data was used as part of the burrow density sample. If active looking burrows were observed in the vicinity of one quadrat, but were absent from the area surrounding an adjacent quadrat, the colony boundary was delimitated half way between the two quadrats, unless an obvious border was encountered. The same criteria was applied between transects. On most colonies, colony boundaries were distinct and precise measurements of the extent of colony were often possible.

Distance, elevation, and slope measurements taken along the transects, as well as during the exploration, were used to draw colony areas on detailed topographic maps or air photos. The horizontal surface area of the colony was measured on that map with a compensating polar planimeter. Adjusting for slope, the area of the colony was given by:

$$C_s = A_h T^2 (\cos \bar{x})^{-1}$$

where C_s is the colony surface area, A_h is the area on the map, T is the scale of the map, and $\bar{x}$ is the mean slope along the transects. Our colony area calculations take into account the average uphill slope, but not the undulations between quadrats or between transects. Therefore our calculations give a conservative estimate of the total surface area available to the birds for nesting.

4.4. **Burrow density:** Data from all plots located within colony area were used to calculate an average burrow density for the colony.

4.5. **Occupancy:** The percentage of burrows that actually contained nesting birds was determined by complete examination of a sample of burrows. If an adult, an egg, a chick, or freshly hatched egg membrane was found, the burrow was considered occupied. Burrows were considered empty if all tunnel branches were explored and none of the above were found. Signs such as a well worn entrance or droppings were not used to distinguish between occupied and empty burrows. Exploring burrows longer than an arm's reach required digging one or more access holes until the end was reached. Dug holes were immediately patched over. The contents of many burrows were impossible to determine because they extended under roots or fallen trees or into cavities within tree bases. To minimize disturbance, adults were not pulled from burrows except to confirm species identification.

To obtain a representative sample of the entire colony, we attempted to determine the occupancy of each burrow located within surveyed quadrats. Due to time constraints we were often unable to explore burrows in every quadrat. In those cases we selected quadrats from as many areas of the colony as time permitted and explored every burrow in each quadrat selected. On some colonies, transects were run early in the nesting season before all birds were nesting, and occupancy was determined later in one or two areas. Areas were chosen where burrows were frequent and a sample could be obtained within a reasonable time frame. To minimize the bias within those areas, we started from a central point and explored every burrow encountered within an expanding radius until we had an adequate sample. The size of those areas was not measured. Their locations are indicated on colony maps.

When we had data on occupancy from several plots, we calculated the occupancy rate according to the formula:

$$R = \frac{\bar{x}}{\bar{y}}$$

where x is the number of occupied burrows in each quadrat, and y is the total number of burrows of known status in each quadrat.

The variance of R is calculated from:

$$\mathrm{Var}(R) = \frac{\bar{x}^2}{\bar{y}^2}\left[\frac{s_x^2}{\bar{x}^2} + \frac{s_y^2}{\bar{y}^2} - \frac{2s_{xy}^2}{\bar{x}\,\bar{y}}\right]$$

where s_x is the standard error of $\bar{x}$, s_y is the standard error of $\bar{y}$, and s_{xy}^2 is the covariance of $\bar{x}$ and $\bar{y}$.

The standard error of R is then the square root of Var(R).

On some colonies an occupancy rate was not determined either due to lack of time or because our survey occurred too early or too late in the breeding season. To estimate a nesting population on those colonies we used a median occupancy rate based on data from all other colonies of that species surveyed in British Columbia (Rodway *et al*. 1988). To calculate a median rate for storm-petrels we only used occupancy rates determined when both species were nesting (see Vermeer *et al*. 1988), unless there was only one species present. On some colonies we were too early to determine an occupancy rate for Leach's Storm-Petrels, but were able to obtain a rate for Fork-tailed Storm-Petrels. In those cases we calculated population estimates for both species by using the median storm-petrel occupancy rate, deriving the number of Leach's Storm-Petrels by default according to the formulas:

$$P_F = B \frac{F+E \frac{F}{F+L}}{K}$$

$$P_L = BM - P_F$$

where P_F and P_L are nesting population estimates for Fork-tailed and Leach's Storm-Petrels respectively, **B** is the total number of burrows in the colony, **F** and **L** are the numbers of known Fork-tailed and Leach's Storm-Petrel burrows at the time of the survey, **E** is the number of occupied but unidentified burrows (e.g. cold eggs), **K** is the total number of burrows with known contents, and **M** is the median occupancy rate. We assumed that occupied but unidentified burrows belonged to the two species in the same proportion as identified burrows. The actual proportion would likely vary at different times in the season.

4.6. **Total burrows and current nesting estimates:** The total number of burrows (**B**) is the product of the overall average density of burrows as determined in the quadrats and the total area of the colony. **B** multiplied by the occupancy rate, (**R**) gives an estimate of nesting pairs (**P**). Calculations are quoted plus or minus one standard error.

The variance of P is calculated from

$$Var(P) = B^2\,Var(R) + R^2\,Var(B) - Var(B) * Var(R)$$

The standard error of P is then the square root of Var(P).

Distinguishing species:

The burrows of different species are often mixed. This presents problems for the surveyor when burrow contents cannot be determined. Identification of burrows must then be based on indicative signs found in the burrow or at the burrow entrance. We developed a set of criteria for distinguishing burrows of storm-petrels, Cassin's Auklets and Rhinoceros Auklets: size of entrance; wear at the entrance; droppings in and around the burrow entrance; regurgitated food (for Cassin's Auklet); feathers found in the burrow; eggshell fragments found in the burrow; and odour. Few Tufted Puffins nest in association with any of these species on the northern mainland coast. Their burrows were readily distinguished by size.

Storm-petrels often nest in conjunction with Cassin's Auklets. Little difficulty is usually encountered differentiating storm-petrel burrows according to size (5-7 cm in width). The musty odour of petrels is also helpful.

Cassin's Auklets and Rhinoceros Auklets are found nesting in the same areas. Cassin's Auklet burrows are generally smaller (10-12 cm in width), while larger burrows (12-15 cm in width) generally belong to Rhinoceros Auklets. Droppings, regurgitated food, fragments, and feathers provide more conclusive evidence for differentiating these species. Rhinoceros Auklets have relatively clean burrow entrances. Their droppings are large, generally globular, pale yellow with black, viscous blobs, and are often deposited to one side of the burrow entrance. Cassin's Auklets leave white fecal streaking along the approach and into the entrances of their burrows. Cassin's Auklet droppings also have a more arresting odour, as does their regurgitated food, some of which they invariably lose at the entrance to their burrows when they are delivering it. Abdominal feathers (which are often lost in the burrows) of each species can be distinguished by the colour pattern of their plumules (size is not reliable). Cassin's Auklet plumules are mostly dark with a tip of white. The colour of the Rhinoceros Auklet plumule is uniform greyish white and is similar to that of the base of the main feather. Eggshell fragments of Cassin's Auklets and Rhinoceros Auklets are both white and are inseparable unless a major portion of the shell is present and can be distinguished by size.

Predation:

During exploration, notes were kept of all signs of predation or mortality encountered. Areas around Bald Eagle, Peregrine Falcon, and Common Raven nests, and around river otter runs and dens were examined in detail. This gave an indication of the degree and the kind of species being preyed upon.

Staging:

Near dusk, prior to flying into their nesting slopes, Rhinoceros Auklets typically flock up on the water adjacent to their colony. We made many boat trips between and around the main colonies on Moore, Whitmore and Byers islands, during which we kept records of numbers and locations of all birds sighted.

Time:

Times quoted are Daylight Savings Time. Subtract one hour from Daylight Savings Time to get Pacific Standard Time.

MC-030 GREY ISLAND 103 J/10

Location: East of Dundas Island. 54°34′20"N 130°41′33"W

Land status: Crown land.

Date of visit: 17 June 1988.

Colony access: Drop-off from boat.

Observers: H. Hay, N. Holmes.

Census method: Total count.

Description: Grey Island is a 9 m high, grassy rock.

Nesting species:

Black Oystercatcher: Two nests were found: 1 with 2 eggs and 2 with 3 eggs.

Glaucous-winged Gull: A total of 108 nests were counted (Table MC030-1). Two depredated eggs were found.

Table MC030-1. Glaucous-winged Gull nests on Grey Island in 1988.

Empty	1E	2E	3E	Total
24	21	36	27	108

Pigeon Guillemot: One nest with one egg was discovered.

MC-040 GREEN ISLAND 103 J/10

Location: East of Dundas Island. 54°34'08"N 130°42'15"W

Land status: Crown land; Canadian Coastguard lighthouse reserve.

Date of visit: 17 June 1988.

Colony access: Drop-off from boat.

Observers: M. Alvarez, G. Kaiser.

Census method: Total count.

Description: Grass covers the higher portins of the 19 m high, main island. There are tidally connected rocks off the northwest corner, and a manned light station on the high point of the island.

Nesting species:

Black Oystercatcher: Two nests were found with 2 eggs each.

Glaucous-winged Gull: A total of 248 nests were counted (Table MC040-1). Five depredated and one buried egg were found.

Table MC040-1. Glaucous-winged Gull nests on Green Island in 1988.

	Empty	1E	2E	3E	4E	Total
Small islet	21	16	30	63		130
Main island	4	15	24	72	3	118
Total	25	31	54	135	3	248

Pigeon Guillemot: There were 35 guillemots around the island.

Other birds and mammals sighted:

Harlequin Duck - 32

MC-070 "BARON" CLIFFS 103 J/7

Location: On the north ends of two islets with elevations of 62 m and 70 m off the southwest end of Baron Island.
54°27'05"N 130°51'33"W and 54°26'24"N 130°53'36"W

Land status: Crown land.

Date of visit: 15 May 1987 (1300-1400 h).

Colony access: Drop-off from boat for exploration of vegetated areas, and observation from boat for nesting cliffs.

Observers: M. Lemon, M. Rodway, B. Carter, D. Grinnell.

Census method: Exploration of vegetated areas on outer islands (see Fig. MC070/080-1) and count from boat at cliffs.

Description: Most islands off the southwest end of Baron Island have steep rocky shores with dense, scrubby forests of cedar and hemlock overhanging the rock edge. Smaller outer rocks have patches of more open vegetation, including Maianthemum and grass, under scattered spruce trees. The nesting cliffs are 30 m high and overhung with thick salal and some grass.

Nesting species:

Pigeon Guillemot: We observed 15 guillemots at the base of the cliffs on the northeast corner of the eastern, 62 m high islet. One crevice with heavy fecal streaking at its entrance, and one well worn burrow in an overhanging grass tussock were visible. There were 40 guillemots present, some flying into crevices, on the northwest corner of the western, 70 m high islet (Fig. MC070/080-1).

Associated species:

Pelagic Cormorant - 7 cormorants, 3 in breeding plumage, roosting on the west side of the cliffs on the 70 m islet.

Glaucous-winged Gull - 1 pair on the rocks on the west side of the cliffs on the 70 m islet.

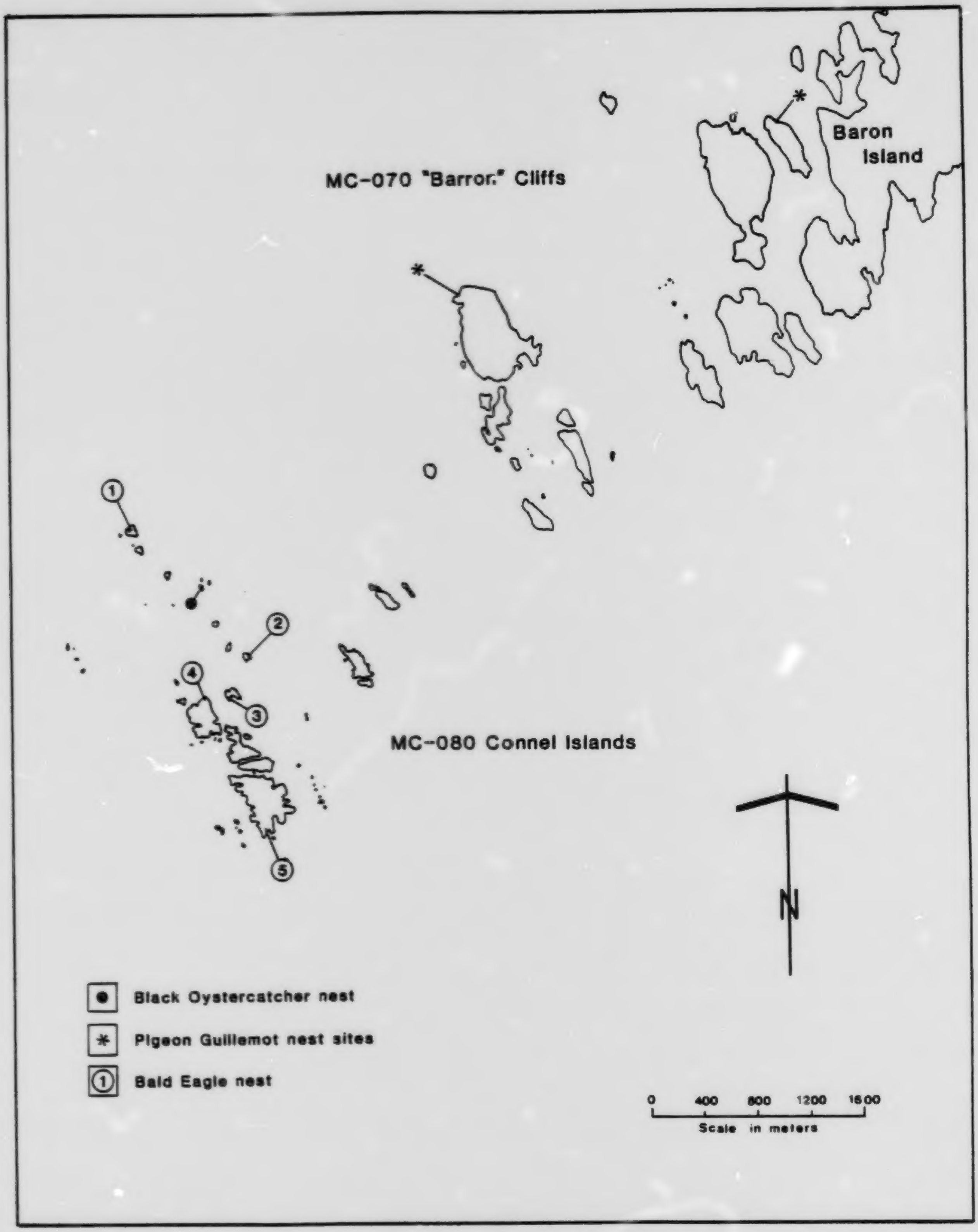

Figure MC070/080-1. Seabird nesting areas on "Baron" Cliffs and Connel Islands in 1987.

MC-080 CONNEL ISLANDS

103 J/7

Location: South of Dundas Island at the west entrance to Hudson Bay Passage. 54°24'30"N 130°55'30"W

Land status: Crown land.

Date of visit: 18 May 1987 (1130-1730 h).

Colony access: Boat landings on small, sandy beaches on main islands; drop-off from boat for smaller islets and rocks.

Observers: M. Lemon, M. Rodway, B. Carter, R. Chaundy, D. Grinnell, C. Rodway.

Census method: Exploration and total count.

Description: These granitic islands include higher forested islands, rising to a maximum elevation of 49 m, and lower grassy and bare rocks. There are rock bluffs and cliffs on larger islands, and a sand dune between two central islands. Much of the vegetated area is thick salal and other shrubs under a spruce forest, but open areas of grass, forbs, moss or bare litter are frequent.

Nesting species:

Black Oystercatcher: We found one nest built of rock chips and shells and containing one egg on a small rock near the north end of the islands (Fig. MC070/080-1). Two adults were present. Four oystercatchers flew by the most northern islet, and 2 were seen on the southern rocks.

Glaucous-winged Gull: There was no evidence of nesting by gulls. Four adults were seen on tidal rocks.

Pigeon Guillemot: There were 12 guillemots in the northeast bay of the large, south island.

Rhinoceros Auklet: No evidence of nesting was found. Mink burrows were frequent on vegetated islands (see below). They were similar in size to auklet burrows.

Predation: We found feather piles of an adult Herring Gull, Glaucous-winged Gull, and an immature Black-legged Kittiwake.

Associated species:

Pelagic Cormorant - 3 in breeding plumage and 16 immatures roosting on tidal rocks on the northern islands; 7 on south rocks.

Bald Eagle - Eight adults and 2 immatures perched on southern islets. Five nests were located, at least 4 of which appeared active (Fig. MC070/080-1):

1. On the northwest corner of the most northern island; 20 m high in 30 m spruce, 10 m from shore. Adult flew out of nest.
2. On the 16 m high islet northeast of the main cluster of islands; 20 m high in 22 m snag near shore. One adult present.
3. On 37 m high islet at the northeast end of the main group of islands; 15 m high in spruce on southern knoll.
4. On northeast tip of large, 43 m high island at northwest end of main group of islands; 25 m high in 40 m spruce, 20 m from shore. Two adults in vicinity.
5. Near south end of west side of largest south island; 25 m high in 35 m spruce, 100 m from shore. Adult perched in top of nest tree.

Northwestern Crow - 10+

Common Raven - 2 chasing eagle on south island. One nest on large, south island, 7 m high in 15 m spruce. There were 2 fully feathered young in the nest.

Mink - Signs of mink were abundant. We encountered many Cassin's and Rhinoceros auklet sized burrows with crab shells, abalone shells and fish bones at their entrances and inside.

River Otter - Many runs and denning sites. Scats were of fish.

Other birds and mammals sighted:

Pacific Loon - 1
Harlequin Duck - 6 male, 9 female.
White-winged Scoter - 9
Wandering Tattler - 1
Whimbrel - 3
Belted Kingfisher - 2
Rufous Hummingbird
Western Flycatcher
Winter Wren
Golden-crowned Kinglet
Varied Thrush
Orange-crowned Warbler
Savannah Sparrow
Song Sparrow
Red Crossbill - 15

Harbour Seal - 8 on northern rocks, 13 on southern islets.

Beaver - Old chewings on crabapple tree on larger islands.

MC-090 "SIMPSON" ROCKS 103 J/7

Location: Just north of Simpson Rock off the southwest corner of Melville Island. 54°21'01"N 130°46'55"W

Land status: Crown land.

Date of visit: 20 June 1988.

Colony access: Drop-off from boat.

Observers: H. Hay, G. Kaiser.

Census method: Total count.

Description: These are 6 m high rocks.

Nesting species:

Black Oystercatcher: One pair of oystercatchers was suspected nesting.

Glaucous-winged Gull: A total of 178 nests were counted (Table MC090-1).

Table MC090-1. Glaucous-winged Gull nests on "Simpson" Rocks in 1988.

Empty	1E	2E	3E	Total
5	16	36	121	178

Pigeon Guillemot: About 25 guillemots were sighted around the rocks.

Associated species:

Pelagic Cormorant - 10

Other birds and mammals sighted:

Harlequin Duck - 11

MC-100 LUCY ISLANDS 103 J/7

Location: West of Prince Rupert in central Chatham Sound. 54°17'40"N 130°37'W

Land status: Crown land; Canadian Coastguard lighthouse reserve.

Date of visit: July 1983 (transects); 16 July 1984 and 18, 19 June 1988 (gull surveys). Surveys in 1983 and 1984 were done in conjunction with a Rhinoceros Auklet growth study conducted between 1983 and 1986 (Bertram 1988; Bertram and Kaiser 1988).

Colony access: Boat landings on sandy beaches on main islands; drop-off from boat for smaller islets.

Observers: 1983: D. Bertram, A. Breault, R. Emery, D. Powell, M. Amedro; 1984: M. Amedro, D. Bertram, Y. Turcotte; 1988: M. Alvarez, H. Hay, N. Holmes, G. Kaiser.

Census method: Line transects: 282 quadrats, 2x2 m, on islands A and C, plus 87 quadrats, 3x3 m, on island D surveyed at 6 m intervals along 19 transects (Fig. MC100-1). Parallel transects, spaced 77-86 m apart were run across islands A and D at a bearing of 180°. On island C transects ran perpendicular to the shoreline and stopped at the end of the colony. Detailed transect parameters and specific locations of transects on islands C and D were not recorded on this survey. Partial counts of Rhinoceros Auklet burrows were done on islands E, F, and H. Total counts were conducted for gulls.

Description: Most islands of this group are connected by sandy beaches and tidal mud flats, with a few isolated islets offshore. Their total area is 24.0 ha. The topography is generally low and undulating, with some steep slopes on perimeter areas above rocky shores rising to a maximum elevation of 59 m. Forests are primarily spruce, mixing with hemlock in the interior of larger islands. Pockets of alder occur on some islets. Nesting auklets keep much of the ground bare, but interior areas are mossy with

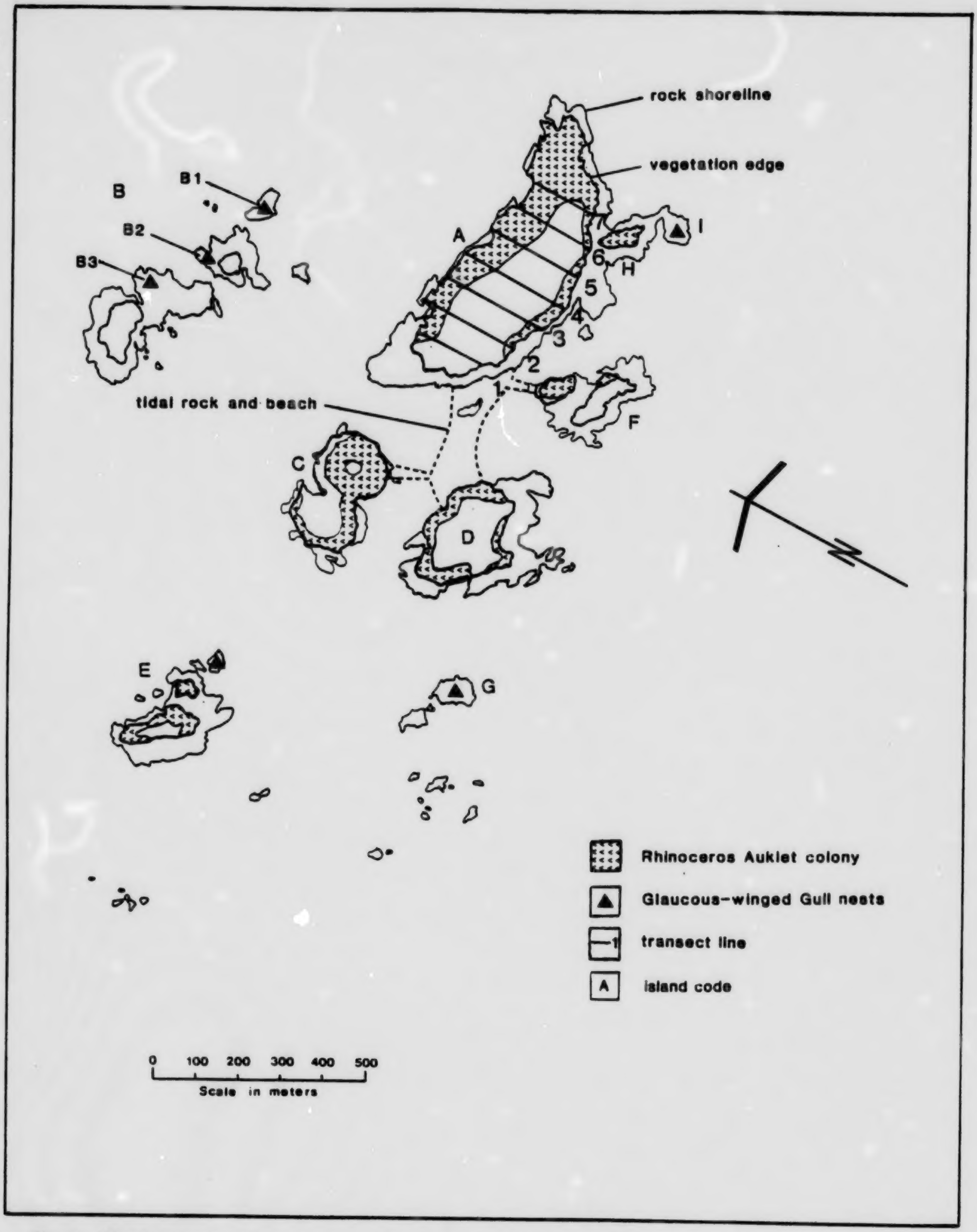

Figure MC100-1. Seabird colony areas on Lucy Islands in 1983.

scattered shrubs, becoming dense in some areas. Grass and forbs grow along perimeter fringes.

There was a manned lighthouse on the east point of the main island which was dismantled in 1988.

Nesting species:

Black Oystercatcher: Eight oystercatchers were seen in 1983 and four pairs were suspected nesting in 1988. Four empty scrapes were found in 1988.

Glaucous-winged Gull: There were 114 adults on nesting islands on 27 July 1983. Observers counted 52 nests in 1984 and 59 nests in 1988 (Tables MC100-1 and 2). Seven eggs were pipping in 1984.

Table MC100-1. Glaucous-winged Gull nests on Lucy Islands in 1984.

Island	Empty	1E	2E	3E	2E1Y	Total
B1		5	9	5		19
B2			2			2
B3			6	2		8
E			4			4
G		3	8	4	1	16
H		1	1	1		3
Total		9	30	12	1	52

Table MC100-2. Glaucous-winged Gull nests on Lucy Islands in 1988.

Empty	1E	2E	3E	Total
34	11	9	5	59

Pigeon Guillemot: A total of 197 guillemots were counted around the islands on 27 July 1983. Observers counted 54 guillemots around islands B, E, and G in the afternoon of 18 July 1984. One guillemot nest with 2 eggs was found in 1988.

Rhinoceros Auklet: Rhinoceros Auklets were burrowing around the perimeter of most vegetated islands, extending as far as 120 m inland on the main island (Table MC100-3).

1983 Population estimate:

Number of sample plots:	Island A:	132 (2x2 m; 528 m² - 1.0% of colony)
	C:	36 (2x2 m; 144 m² - 0.6% of colony)
	D:	38 (3x3 m; 342 m² - 2.1% of colony)
	Total:	206 (1014 m² - 1.0% of colony)
Average density:	Island A:	3920 ± 250 burrows/ha
	C:	3264 ± 420 burrows/ha
	D:	1491 ± 174 burrows/ha
	Overall:	3459 ± 183 burrows/ha
Colony area:	Island A:	5.47 ha
	C:	2.46 ha
	D:	1.60 ha
	E,F,H:	not measured
	Total:	9.53 ha
Total burrows:	Island A:	21,456 ± 1368
	C:	8,029 ± 1033
	D:	2,384 ± 278
	E:	462
	F:	250
	H:	275
	Total:	32,856 ± 1737
1983 Occupancy rate:		not determined.

Use median British Columbia rate of 77% (Rodway *et al*. 1988).

1983 Nesting population:		25,299 ± 1337 pairs

Table MC100-3. Number of Rhinoceros Auklet burrows in 2x2 m plots (islands A and C) and 3x3 m plots (island D) on Lucy Islands in 1983. Plots considered outside the colony are indicated by a dash.

	Transect and island																		
Plot	1A	2A	3A	4A	5A	6A	7A	1C	2C	3C	4C	5C	6C	1D	2D	3D	4D	5D	6D
1	2	2	5	2	1	4	-	2	1	0	2	2	2	1	-	3	0	2	2
2	0	1	3	3	4	3	3	4	2	0	0	0	1	-	-	1	2	2	2
3	1	3	1	1	1	4	3	1	1	2	-	-	0	-	-	-	2	-	1
4	2	1	4	3	2	3	3	3	0	1	-	-	2	-	-	-	1	-	1
5	1	0	2	2	4	3	-	1	0	0	-	-	0	1	-	-	2	-	0
6	0	2	2	2	2	0	-	2	2	0	1	-	2	-	-	-		-	1
7	2	1	4	1	0	3	-	2	1	1	-	-	-	-	-	-		1	4
8	0	3	3	1	1	3	-	1	2	-	-	-	-	2	-	-		4	1
9	1	2	2	2	2	0	1	2	-	-	-	-	-	2	-	-		1	0
10	1	0	1	0	3	2	4	-	-	-	-			1	1	-		1	0
11	-	0	1	1	1	0	1	-			-				-	-		2	
12	-	0	2	2	2	1	1				-				-	-		0	
13	-	1	1	0	2	1	3				-				-	-		1	
14	-	-	2	0	3	1	3				-				-	-			
15	-	-	0	0	1	-	0				1				-	-			
16	-	-	0	1	1	-	1								-	-			
17	-	-	2	-	1	-	1								-	-			
18	-	-	2	-	0	-	2								-	-			
19	-	-	0	-	1	-	0								-	-			
20	-	-	1	-	1	-	0									-			
21	-	-	-	-	-	-	2									-			
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26	-	-	-	1	-		0									1			
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37			-																
38			-																
39			-																
40			-																
41			-																
42			1																
43			2																
44			2																

Predation: Eagles and crows were observed raiding the gull colony at 1430 h on 19 June 1988 (Kaiser 1989).

Associated species:

Pelagic Cormorant - 3 on 27 July 1983.

Bald Eagle - 4 in 1983; 28 adult and immature eagles gathered on the islands at 2330 h on 19 June 1988. No nests were recorded.

Common Murre - 1 on 27 July 1983.

Marbled Murrelet - 2 in 1983; 5 in 1984.

Other birds and mammals sighted: Sightings are from 1983.

Harlequin Duck - 42 on 27 July.
White-winged Scoter - 3 on 27 July.
Wandering Tattler - 8 on 27 July.
Spotted Sandpiper - 2 on 27 July.
Black Turnstone - 88 on 27 July.
Surfbird - 32 on 27 July.
Harbour Seal - 30 on 27 July.

MC-110 TREE KNOB GROUP 103 J/7

Location: Northwest of Stephens Island; south side of Brown Passage; including Triple Islands, Osbourne Islands and Rushton Island. 54°14′ to 54°17′30″N 130°48′ to 130°52′W

Land status: Crown land; Indian Reserve on Rushton Island; Canadian Coastguard lighthouse reserve on Triple Islands.

Date of visit: 19-22 May 1987 (exploration of all islands); 20 June 1988 (cormorant and gull counts).

Colony access: Drop-off from boat on most islets; boat landings on the east side of Rushton Island.

Observers: 1987: M. Lemon, M. Rodway, B. Carter, R. Chaundy, D. Grinnell, C. Rodway; 1988: M. Alvarez, H. Hay, N. Holmes, G. Kaiser.

Census method: Exploration and total count.

Description: Rushton is the largest island in the group and rises to a maximum elevation of 51 m. Forests of spruce, hemlock and redcedar cover most islands. Dense salal and other shrubs form much of the understory on larger islands, though open patches of grass and forbs occur on perimeters, and extensive areas of bare litter occur in the interior of Rushton Island. Trees and shrubs are windswept on exposed slopes. Small outer islets are bare or grassy rocks. A manned lighthouse is perched on the northern of the Triple Islands.

Nesting species:

Pelagic Cormorant: Cormorants were nesting on the western of the rocks west of Osborne Islands and on the 7 m high rock 2 km southwest of Osborne Islands (Table MC110-1; Fig. MC110-1).

Table MC110-1. Pelagic Cormorant nests on the Tree Knob Group in 1988.

Island	Empty	1E	2E	3E	Total
W of Osborne I.	0	2	0	2	4
7 m rock	11	7	0	0	18
Total	11	9	0	2	22

Glaucous-winged Gull: In 1988, gulls were nesting on the rocks west of the Osborne Islands and on the 7 m high rock 2 km southwest of Osborne Islands (Table MC110-2; Fig. MC110-1). Nests were counted on the western of the rocks west of the Osborne islands and estimated on the two eastern rocks as landing was too difficult. We counted 54 adults on the 7 m rock on 20 May 1987 but no nests had been built.

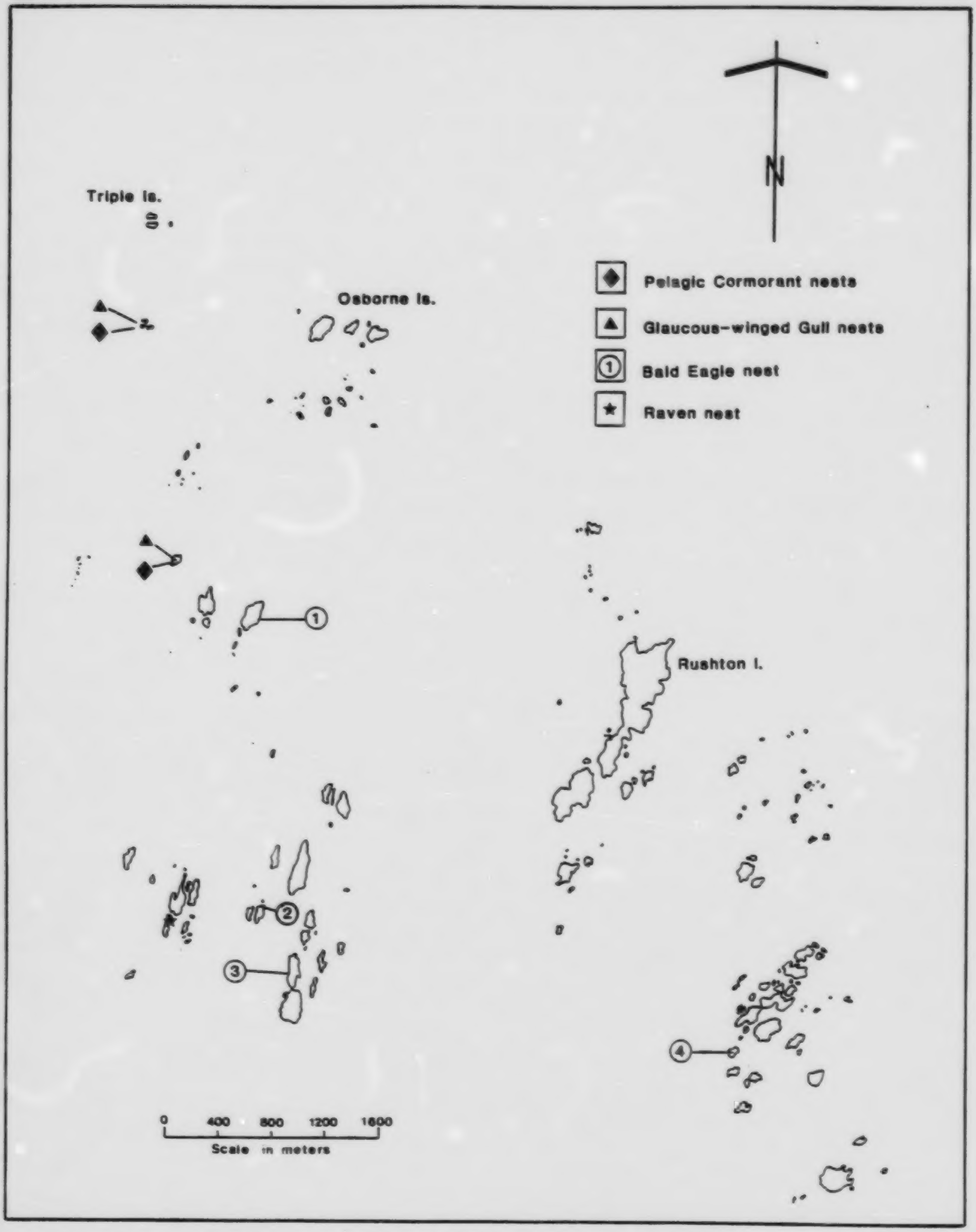


Figure MC110-1. Seabird nesting areas on the Tree Knob Group in 1988.

Table MC110-2. Glaucous-winged Gull nests on the Tree Knob Group in 1988.

Island	Empty	1E	2E	3E	Estimated	Total
W of Osborne Is.						
- west rock	1	1	7	15		24
- east rocks					10	10
7 m rock	9	7	4	6		26
Total	10	8	11	21	10	60

Associated species: (all records are from 1987)

Bald Eagle - 2 adults, 1 immature around Rushton Island; 5 adults, 7 immatures around southeast islets. 4 nests were found:
1. 15 m high in spruce. 1 adult present.
2. 15 m high in 20 m spruce, 40 m from shore. 2 eggs in nest. Nest lined with grass and some moss. 2 adults present. 2 shearwater primaries in nest.
3. 10 m high in 15 m spruce, 15 m from shore. 2 eggs in nest. Nest lined with grass, lichen and moss. 2 adults present. No prey remains in nest.
4. 10 m high in spruce. Adult sitting in nest.

Peregrine Falcon - 1 flying over southeast islands on 21 May.

Black Oystercatcher - 2 flying by on 20 May. They may have been nesting on the 7 m high gull rock.

Northwestern Crow - Maximum of 6 seen. 3 nests seen in crabapple trees.

Common Raven - 1 nest was found on the western islets (Fig. MC110-1); 2.5 m high in 5 m spruce. 2 young with feathers just beginning to emerge. Nest lined with grass and bits of lichen. 2 adults present.

Mink - 2 on beach on east side of Rushton Island. Signs of mink were abundant on most islands. We encountered many mink burrows, which were the size of Cassin's and Rhinoceros auklet burrows, with crab shells, abalone shells and fish bones at their entrances and inside.

River Otter - Some trails on southwest island but little sign of recent activity.

Other birds and mammals sighted: (all records are from 1987)

Common Loon - 1 in breeding plumage, 3 in winter plumage.

Pacific Loon - 1

Great Blue Heron - 1 flying by Rushton Island on 20 May.

Greater Scaup - 5 male, 2 female on 19 May.

Harlequin Duck - 1 pair on 19 May; 3 male, 1 female on 20 May.

White-winged Scoter - 56 on 19 May; >1000 flying north at 2030-2100 h on 21 May - flocks of 30 to 400 birds, mostly 60 to 100 birds.

Sandhill Crane - Flying and calling at 1230 h on 21 May.

Black-bellied Plover - 1 in breeding plumage on 19 May; 4 on 20 May; 6 on 21 May.

Wandering Tattler - 2

Spotted Sandpiper - 2

Whimbrel - 26 flying by at 1900 h and 38 flying by at 2040 h on 19 May; 16 at 0930 h and 18 at 1800 h on 20 May; 27 at 1800 h on 21 May; 30 at 0800 h on 22 May.

Belted Kingfisher - 2
Rufous Hummingbird
Western Flycatcher
Chestnut-backed Chickadee
Red-breasted Nuthatch
Winter Wren
Golden-crowned Kinglet
Hermit Thrush
American Robin
Orange-crowned Warbler
Townsend's Warbler
Wilson's Warbler
Savannah Sparrow
Song Sparrow
Golden-crowned Sparrow
Red Crossbill

Harbour Seal - 1 on 19 May

MC-120 ROLAND ROCKS

Location: West of Stephens Island. 54°10′10"N 130°50′27"W

Land status: Crown land.

Date of visit: 20 June 1988.

Colony access: Drop-off from boat.

Observers: M. Alvarez, H. Hay, N. Holmes, G. Kaiser.

Census method: Total count.

Description: Roland Rocks are bare rocks rising to a maximum elevation of 9 m.

Nesting species:

Glaucous-winged Gull: A total of 88 nests were counted (Table MC120-1). One depredated egg was found.

Table MC120-1. Glaucous-winged Gull nests on Roland Rocks in 1988.

Empty	1E	2E	3E	4E	Total
8	16	25	38	1	88

Associated species:

Pelagic Cormorant - 8 roosting.

Other birds and mammals sighted:

Harlequin Duck - 5

Northern Sea Lion - 50 on the southwest rock.

MC-130 RACHAEL ISLANDS

Location: Southern Chatham Sound, northeast of Stephens Island.
54°12'N 130°33'W

Land status: Crown land.

Date of visit: 26-29 May 1987 (exploration and total count for Rhinoceros Auklets on 28 May); 20 June 1988 (gull survey).

Colony access: Boat landing and camping on northwest corner of south Rachael Island. Drop-off from boat for small rocks.

Observers: 1987: M. Lemon, M. Rodway, B. Carter, R. Chaundy, D. Grinnell, C. Rodway; 1988: M. Alvarez, H. Hay, N. Holmes, G. Kaiser.

Census method: Total count. We conducted a boat survey for staging Rhinoceros Auklets at 2140-2250 h on 27 May 1987. We boated around both islands criss-crossing all areas up to 2 km offshore.

Description: Rachael Islands are comprised of two main forested islands, plus a few small, tidally connected islets and rocks. They have a total area of 48.4 ha and rise to a maximum elevation of 67 m. Except for a beach at the northwest corner of the south island, the shorelines are rocky, with many small knolls and valleys. Forests are a mix of hemlock, spruce and redcedar. *Maianthemum*, grass amd moss are common on perimeter knolls and slopes, and bare litter occurs under dense stands of young hemlock and spruce. Salmonberry, huckleberry and false azalea grow on low ground, becoming more dense in some areas.

A number of large trees have been cut in the past in a bay on the north side of the south island. There are light beacons on the north and south ends of the islands.

Nesting species:

Black Oystercatcher: We found 5 nests in 1987: 1 empty; 1 with 1 egg; and 3 with 3 eggs (Fig. MC130-1). Nests were built of rock chips plus a few barnacle, limpet, mussel, and clam shell fragments. Three nests with 2 eggs each were found in 1988.

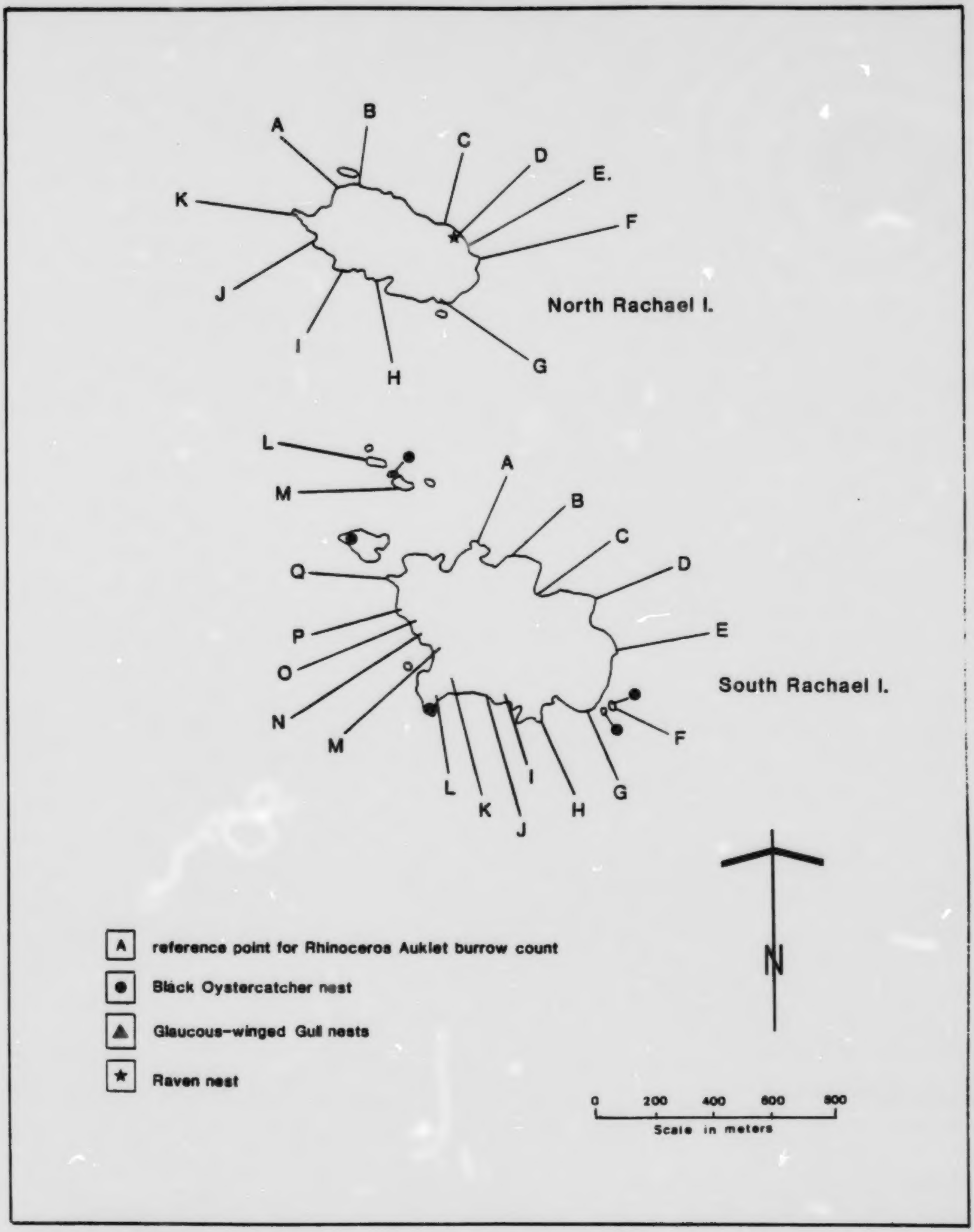

North Rachael I.
A
B
C
D
E.
F
G
H
I
J
K
South Rachael I.
A
B
C
D
E
F
G
H
I
J
K
L
M
N
O
P
Q
L
M
N
A reference point for Rhinoceros Auklet burrow count
● Black Oystercatcher nest
▲ Glaucous-winged Gull nests
★ Raven nest
0
200
400
600
800
Scale in meters

Figure MC130-1. Seabird nesting areas on Rachael Islands in 1987 and 1988.

Glaucous-winged Gull: At the time of our visit in 1987, gulls were just beginning to build nests; 6 nest starts and 10 pairs of adults were seen on the group of small rocky islets between the large north and south islands (Fig. MC130-1). A total of 25 nests were counted in 1988 (Table MC130-1). Three depredated eggs were found.

Table MC130-1. Glaucous-winged Gull nests on Rachael Islands in 1988.

Empty	1E	2E	3E	Total
11	3	2	9	25

Pigeon Guillemot: There were 42 birds along the south side of the north island at 1130 h on 28 May. We suspected nesting in this area, especially at the southwest corner of the island. Eight birds were seen in 1988.

Rhinoceros Auklet: Rhinoceros Auklet burrows were scattered around most perimeter areas (Table MC130-2; Fig, MC130-1). Most burrows were within 10 m of shore, some were as far as 30 m inland. Of 865 burrows counted, 560 were obviously unused, with cobwebs and vegetation obscuring their entrances. Some unused burrows had clam and chiton shells near their entrances. Active-looking burrows were worn with droppings and feathers at their entrances. Most burrows were located under fallen logs and tree roots. The largest concentration of burrows was found around the southeast corner of the southern island, though 70% of the burrows on the south island appeared unused. There was a higher proportion (50%) of active-looking burrows on the north island. We estimated 300 pairs of Rhinoceros Auklets nesting on the Rachael Islands. No burrow contents were determined and breeding was unconfirmed.

Staging: We counted 72 Rhinoceros Auklets around the north and west sides of the north island during the boat survey on 27 May 1987. They were staging approximately 0.8 to 1.5 km offshore.

Predation: In 1987, numerous scats found along perimeter trails were composed of crab shell. We suspected the presence of mink. Bones and feather piles of Rhinoceros Auklets were frequently encountered, especially on the north island. Many bones occurred where there were also concentrations of abalone and limpet shells.

Table MC130-2. Numbers of Rhinoceros Auklet burrows counted around Rachael Islands in 1987.

Reference point	Burrows in vicinity of points		
	Worn	Unused	Total
North island:			
A	3	3	6
B	3	0	3
C	1	5	6
D	3	9	12
E	8	36	44
F	11	33	44
G	4	0	4
H	6	0	6
I	24	0	24
J	12	6	18
K	1	3	4
Estimated (points G-K)	47	29	76
Total (N island)	123	124	247
Middle islets:			
L	4	11	15
M	0	2	2
South island:			
A	4	3	7
B	6	2	8
C	0	0	0
D	5	18	23
E	0	0	0
F	0	0	0
G	33	63	96
H	70	85	155
I	3	35	38
J	21	72	93
K	0	0	0
L	6	7	13
M	1	4	5
N	7	41	48
O	8	52	60
P	5	14	19
Q	7	9	16
Estimated (point I)	2	18	20
Total (S island)	178	423	601
Overall total	305	560	865

A number of remains were found around a raven nest on the north island. Other evidence of predation included: 1 immature Glaucous-winged Gull wing and 1 Sooty Shearwater wing.

Associated species:

Bald Eagle - 1 adult. 1 dead subadult was found near the forest edge on the north side of the south island.

Northwestern Crow - Maximum of 5 seen; 1 empty nest.

Common Raven - 2 birds; 1 nest 10 m high in 25 m spruce, 25 m from shore on the north island (Fig. MC130-1). 1 young in nest and 2 adults nearby.

River Otter - Runs and scats of fish were encountered in perimeter areas.

Mink - Suspected from numerous scats of crab shells found.

Other birds and mammals sighted: (all records are from 1987 unless noted)

Common Loon - 1 breeding.

Harlequin Duck - 11 in 1988.

White-winged Scoter - 4

Wandering Tattler - 2

Whimbrel - 1

Dowitcher sp. - 2

Rufous Hummingbird

Belted Kingfisher - 2 around camp; 1 seen fly out of hole at top of a 10 m high cliff at the southeast corner of the south island.

Western Flycatcher
Winter Wren
Golden-crowned Kinglet
Ruby-crowned Kinglet - 1 dead female found.
Varied Thrush
Orange-crowned Warbler
Song Sparrow
Red Crossbill

MC-160 GULL ROCKS 103 J/2

Location: South end of Chatham Sound, north of Porcher Island. 54°07'58"N 130°31'10"W

Land status: Crown land.

Date of visit: 27 May 1987 (1200-1215 h).

Colony access: Drop-off from boat.

Observers: M. Rodway, C. Rodway.

Census method: Total count.

Description: This is a small rock with patches of vegetation. There is a light beacon on the rock. Old battery cases have been strewn about.

Nesting species:

Glaucous-winged Gull: Gulls were just beginning to build nests: we found 8 nest starts. There were 78 adults present from which we estimated a breeding population of 39 pairs. Eleven immature gulls were roosting.

Pigeon Guillemot: There were 6 birds on the rock.

Associated species:

Pelagic Cormorant: 2 nonbreeding birds roosting.

MC-170 LAWYER ISLANDS 103 J/1

Location: Northeast of Porcher Island between Malacca and Marcus Passages. 54°06'45"N 130°20'20"W

Land status: Crown land.

Date of visit: 27 May 1987.

Colony access: Drop-off from boat.

Observers: M. Lemon, R. Chaundy, D. Grinnell, H. Hay, N. Holmes.

Census method: Total count.

Description: This small chain of islands has rocky shorelines and some rocky knobs connected to the shore. Much of the forest has been cut in the past, and stands of young spruce, hemlock and redcedar now cover those areas. Ground cover is forbs, grass and moss alternating with patches of salal, salmonberry and other shrubs along open perimeters, changing to bare litter in interior areas under dense canopy. The largest island rises to a maximum elevation of 43 m and has a manned lightstation on its northwest corner.

Nesting species: There was no evidence of nesting by gulls or by burrowing alcids.

Black Oystercatcher: Four oystercatcher nests were found: two with 3 eggs each on the rock near the helicopter pad by the lightstation on the northwest corner of the main island; one with 2 eggs on a rock on the east side of the main island; and one empty nest on the south end of the small islet north of the 33 m high island at the south end of the chain. Nests were built of rock chips and clam shell fragments.

Associated species:

Pelagic Cormorant - 2 nonbreeding

Bald Eagle - 1 nest on the most southern islet: 18 m high in 25 m spruce on edge of surge channel. 3 adults flying and landing in the area.

Northwestern Crow - 4

Common Raven - 2

River Otter - Dens, runs and scats of fish.

Mink - Observers suspected the presence of mink from trails, burrows and shells encountered.

Other birds and mammals sighted:

Whimbrel - 2
Rufous Hummingbird
Winter Wren - carrying food
Golden-crowned Kinglet

American Robin
Hermit Thrush
Orange-crowned Warbler
Yellow Warbler
Song Sparrow

MC-200 JOSEPH ISLAND 103 G/1

Location: West of the south end of Banks Island.
53°08'40"N 130°02'26"W

Land status: Crown land.

Date of visit: 15 June 1988 (1130-1410 h).

Colony access: Drop-off from boat.

Observers: M. Lemon, M. Rodway, B. Carter, M. Force.

Census method: Total count.

Description: Joseph is a precipitous, dissected, 37 m high granitic rock with a forested crown. Extensive bare, rocky knolls surround most of the island, rising to 30 m elevation without vegetation. There are cliffs on the west side. Windswept, krumholz spruce border the central forested area. Dense salal forms most of the forest understory, with bare litter in some interior gulleys, and grass and forbs on perimeters where soil is shallow.

Nesting species:

Black Oystercatcher: We saw 3 oystercatchers on the island but no evidence of nesting was discovered.

Glaucous-winged Gull: Gulls were nesting only on the east side of the rock from the north to the south end. We counted a total of 245 nests (Table MC200-1). Egg-laying chronology appeared to be different from the north to the south end: almost all nests at the south end had full clutches; only single egg clutches were found at the north end; and there was an even increase in numbers of eggs in nests from north to south. There was no evidence of egg predation to suggest that eggs at the north end may have been lost, and we suspected the difference in nest contents indicated a real difference in timing of egg-laying.

Table MC200-1. Glaucous-winged Gull nests on Joseph Rock in 1988.

Start	Empty	1E	2E	3E	Total
51	114	41	17	22	245

Nests were made of grass, moss, Maianthemum, fern, Conioselium, Angelica, Potentilla and Frittilaria. We found one incomplete egg with no shell that had been laid prematurely on the rocks.

Pigeon Guillemot: A total of 75 guillemots were counted around the island and were suspected nesting. No nests were found and no birds were scared out of crevices in rocks. Many potential nesting sites were quite wet.

Predation: We found 1 pair of Ancient Murrelet wings and 1 recently killed, downy Ancient Murrelet chick, 1 Cassin's Auklet wing, 1 fresh carcass, 1 scavenged carcass, and 6 feather piles of adult Glaucous-winged Gull, and 1 shearwater carcass.

Associated species:

Pelagic Cormorant - 3 in nonbreeding plumage; 3 in breeding plumage.

Brandt's Cormorant - 1 adult roosting.

Bald Eagle - 2 adults; 1 nest 22 m high in 25 m spruce, 20 m from the edge of the vegetation on the northwest corner of the island. Adult nearby was very agitated.

Peregrine Falcon - 1 immature flushed out of a crevice at the south end where he had been scavenging a gull carcass.

Ancient Murrelet - 1 offshore.

Cassin's Auklet - 1 offshore.

Rhinoceros Auklet - 9 offshore.

Common Raven - 2 birds near suspected nest: 10 m high in 15 m spruce, 30 m from west edge of forest.

River Otter - Runs and scats.

Other birds and mammals sighted:

Parasitic Jaeger - 1 adult.
Herring Gull - 1 adult, 1 third year.
Song Sparrow
Harbour Seal - 2
Northern Sea-lion - 2

MC-210 MacDONALD ISLAND 103 A/13

Location: Off the west side of Dewdney Island at the south end of the Estevan Group. 52°58'50"N 129°41'36"W

Land status: Provincial Ecological Reserve.

Date of visit: 15 June 1988 (1627-1720 h).

Colony access: Drop-off from boat.

Observers: M. Lemon, M. Rodway, B. Carter, M. Force.

Census method: Total count.

Description: This is a steep, dome-shaped, granitic island, with a small ridge at the northwest corner isolated fron the main body by a deep crevice. There is a large rocky knoll at the south end of the island. Open herbaceous vegetation covers perimeter slopes above the shore rock, changing to predominantly salmonberry shrub on higher interior slopes under open spruce forest.

Nesting species:

Black Oystercatcher: Two adults were present on the south rock but no nest was found.

Glaucous-winged Gull: Gulls were nesting on the south-facing, bare, rocky point at the northwest corner of the island. We found 6 nests: 1 with 1 egg, 3 with 2 eggs, and 2 with 3 eggs. Nests were built of grass with bits of Saxifraga. There were 12 adults present.

Pigeon Guillemot: Four birds were seen on the west side.

Associated species:

Pelagic Cormorant - 3 nonbreeding plumage.

Bald Eagle - 1 nest 25 m high in 35 m spruce, 50 m from edge of vegetation on the mid-east side of the island.

Marbled Murrelet - 2

Northwestern Crow - 1

Mink - Mink sized trails and denning sites were encountered on the northeast corner, but no conclusive evidence of mink was found.

River Otter - Extensive runs and numerous scats.

Other birds and mammals sighted:

Common Loon- 1 immature.
Golden-crowned Kinglet
Hermit Thrush
Orange-crowned Warbler
Fox Sparrow

MC-220 "PORTER" ROCKS 103 A/13

Location: Southwest of Porter Island at the south end of Dewdney Island, east of Jacinto Island. 52°56′48"N 129°34′12"W

Land status: Provincial Ecological Reserve.

Date of visit: 15 June 1988 (1800-1820 h).

Colony access: Drop-off from boat.

Observers: M. Lemon, M. Rodway, B. Carter, M. Force.

Census method: Total count.

Description: This is a 7 m high rock.

Nesting species:

Glaucous-winged Gull: There were 12 nests: 7 partially constructed, 1 empty, 3 with 1 egg, and 1 with 2 eggs. Nests were made of grass, moss, salal leaves, and Maianthemum.

Other birds and mammals sighted:

Pelagic Cormorant - 1 immature.
Brant - 9
Harlequin Duck - 22 males.

MC-230 GLIDE ISLANDS 103 A/14

Location: Southeast of Dewdney Island. 52°58'N 129°58'55"W

Land status: Provincial Ecological Reserve.

Date of visit: 15 June 1988 (1900-1920 h).

Colony access: Drop-off from boat.

Observers: M. Lemon, M. Rodway, B. Carter, M. Force.

Census method: Total count.

Description: Spruce forest covers most areas on these 61 m high, metamorphic islands. Maianthemum and grass grow along the forest edges, and tall salmonberry dominates the interior. The lower northeast islets are mostly bare rock and herbaceous vegetation, with one small spruce tree.

Nesting species:

Black Oystercatcher: One oystercatcher nest containing 3 eggs was located on the northeast rock. The nest was made of rock chips and limpet shells. Two adults were present.

Glaucous-winged Gull: There were 12 nests on the northeast rock: 2 starts, 7 empty, 2 with 1 egg, and 1 with 3 eggs. Nests were built of grass, Conioselium, and moss.

Pigeon Guillemot: Two birds were flying around the northeast rock.

Associated species:

Peregrine Falcon - 1 nest on the west side of the main island: 35 m high in 40 m spruce, 10 m from the edge of vegetation. Female chased Bald Eagle from area and returned to the nest.

Bald Eagle - 1 suspected nest on east side of the main island: 20 m high in 35 m snag, 8 m from the vegetation edge. There was no activity in the immediate vicinity, but 2 adult eagles were in the area.

Other birds and mammals sighted:

Mew Gull - 1 adult.
Fox Sparrow

MC-240 DUPONT ISLAND 103 A/14

Location: Southeast of Dewdney Island at the entrance to Estevan Sound. 52°56′25"N 129°56′25"W

Land status: Crown land.

Date of visit: 15 June 1988 (1930-2000 h).

Colony access: Drop-off from boat.

Observers: M. Lemon, M. Rodway, B. Carter, M. Force.

Census method: Exploration and partial count. We did not explore the entire perimeter; four areas were examined: the north end, the mid-east side north of the light beacon, the east point around the light beacon, and the south end.

Description: Perimeter slopes are steep in some areas, but most of the island has moderate slopes rising to a maximum elevation of 56 m. Maianthemum covers extensive areas under the spruce forest, with salmonberry more abundant inland. Grass and other forbs grow on fringes, and there is a pocket of fireweed in a gorge on the north end. Trees have been cut down around the light beacon on the east point.

Nesting species:

Storm-Petrel: There were sporadic storm-petrel burrows at the north end, around the east point, and at the south end of the island. Burrows were located in and under logs and stumps on the east point and south end, and on the edges of a 2 m deep gorge filled with fireweed at the north end. We did not find burrows under grass or Maianthemum. Fork-tailed Storm-Petrel feathers were found at the entrance to one burrow near the light beacon, and Leach's Storm-Petrel feathers were found at the entrance to a burrow on the north end. The musty odour of petrels was obvious around all burrows. We counted 26 burrows and estimated breeding populations to be 50 pairs each of Fork-tailed and Leach's storm-petrels.

Black Oystercatcher: We found 3 empty scrapes made of mussel and limpet shells on the rocks at the south end. Six birds were calling excitedly while we were searching, but grouped together and began bowing and calling to each other after we left, suggestive of a group of non-breeding birds.

Rhinoceros Auklet: There was no evidence of nesting by Rhinoceros Auklets in the areas explored.

Associated species:

River Otter - Runs and den.

MC-260 ANDERSON ISLANDS 103 A/14

Location: West of the northern end of Aristazabal Island.
52°47'N 129°21'W

Land status: Crown land.

Date of visit: 6 June 1988 (1000-1400 h).

Colony access: Boat landings on various beaches on larger islands; drop-off from boat for small, rocky islets.

Observers: M. Rodway, B. Carter, D. Grinnell, M. Grinnell.

Census method: Exploration. We explored the outer southwest islands in this group.

Description: These are low islands with rocky knobs and knolls along the shore and in the interior, rising to a maximum elevation of 59 m. Most islands are forested with spruce, hemlock and some redcedar. There are many old snags throughout the forest. Lower areas on the southern islands are meadow-like with tall grass and forbs. Knolls along shore are covered with stunted grasses, *Maianthemum*, *Angelica* and salal, plus worn patches of moss where mink and river otter have been travelling. There are bare litter patches under dense canopy, and salal becomes extensive in some areas, especially on the most western island of the southwest group.

Nesting species: We found no evidence of nesting by seabirds.

Associated species:

Bald Eagle - 2 nests:
1. 15 m high in 18 m spruce, 5 m from shore on the southwest point of the most western of the southwestern group. One adult was sitting in the nest and another was perched nearby.
2. 35 m high in 45 m hemlock, 50 m from shore on the east side of the south island. No activity.

Pigeon Guillemot - 1 off west side of group.

Marbled Murrelet - 4 off northwest island.

Rhinoceros Auklet - 1 off west side of group.

Mink - Signs of mink were abundant on all islands explored. Mink were seen running in and out of burrows on the small, outer, southwestern islet.

Other birds and mammals sighted:

Common Loon - 2 in winter plumage.
White-winged Scoter - 1
Rufous Hummingbird
Western Flycatcher
Barn Swallow

Chestnut-backed Chickadee
Winter Wren
Golden-crowned Kinglet
Hermit Thrush
Varied Thrush
Orange-crowned Warbler
Townsend's Warbler
Song Sparrow
Pine Siskin

MC-270 WELLS ROCKS 103 A/11

Location: West of Anderson Islands, north of Moore Islands. 52°45'N 129°28'W

Land status: Crown land.

Date of visit: 20 June 1988 (1110-1433 h).

Colony access: Drop-off from boat.

Observers: M. Lemon, M. Rodway, B. Carter, M. Force.

Census method: Total count.

Description: The smaller of these metamorphic rocks are mostly bare with tufts of grass and forbs in cracks. Higher rocks, with a maximum elevation of 7 m, are covered with luxuriant grasses (Elymus and Calamagrostis). Contorted spruce decorate high points. There were many old, large, eroded, often dead tussocks of grass, up to 2 m high, which was probably where puffins used to nest.

Nesting species:

We saw no evidence of nesting by storm-petrels, auklets or puffins.

Black Oystercatcher: We found 7 nests: 1 with 1 egg and 1 with 2 eggs on the west rocks; 1 with 3 eggs on the low middle rocks just west of the main vegetated rocks; 1 empty and 1 with 3 eggs on the main vegetaed rocks; and 1 with 1 egg and 1 with 2 eggs on the southeast rock. Nest materials included barnacle, mussel, and chiton shell fragments, pebbles, wood chips, and dead stalks of Angelica.

Glaucous-winged Gull: We counted 83 nests (Table MC270-1). Nests were made of grass, *Cochleria* and seaweed, primarily *Fucus*. Most nests on the west rocks and on lower portions of the other rocks were built mainly of seaweeds. We found 11 depredated eggs.

Table MC270-1. Glaucous-winged Gull nests on Wells Rocks in 1988.

	Start	Empty	1E	2E	3E	4E	Total
West rocks	8	4	7	6	1		26
Middle rocks		4		1			5
Main rocks	3	9	5		3		20
Southeast rocks	3	18	2	3	5	1	32
Total	14	35	14	10	9	1	83

Pigeon Guillemot: There were 19 adults around the rocks, 17 on the north section of the main rocks, and 2 just west of the main rocks. We found 4 nests: 1 with an adult incubating and 1 with a cold egg in crevices on the main rocks; and 2 with single cold eggs, 1 under driftwood and 1 under a rock on the southeast rock.

Associated species:

Pelagic Cormorant - 2 in nonbreeding plumage.

Bald Eagle - 2 adults or subadults; eagle droppings, feathers and pellets were observed around the eroded grass tussocks, where they had been obviously perching.

Cassin's Auklet - 1 off west side.

Northwestern Crow - 1 nest held 1 young with primaries half emerged. Nest was 2 m high in small spruce, and was lined with grass. 2 adults present.

Other birds and mammals sighted:

White-winged Scoter - 1
Whimbrel - 1
Black Turnstone - 1
Song Sparrow
Harbour Seal - 2

MC-280 ISNOR ROCK

103 A/11

Location: Northwest of Moore Islands, west of Wells Rocks.
52°44'12"N 129°3140"'W

Land status: Crown land.

Date of visit: 20 June 1988 (1030-1100 h).

Colony access: Drop-off from boat.

Observers: M. Lemon, M. Rodway, B. Carter, M. Force.

Census method: Total count.

Description: Isnor is an 18 m high rock.

Nesting species:

Black Oystercatcher: There was one nest with 1 downy young, 10 cm long. Nest was on rock with some mussel and barnacle shells. Two adults were present.

Glaucous-winged Gull: One adult was carrying nesting material to the rock and we found one nest start made of *Fucus*. Six other adults flew to the rock and then left again while we were there. No adults were territorial.

Pigeon Guillemot: Eighteen birds were present. We found 2 nests in crevices: 1 with 2 adults calling to each other; and 1 with 1 egg.

Associated species:

Cassin's Auklet - 15 offshore.
Tufted Puffin - 1 offshore.

Other birds and mammals sighted:

White-winged Scoter - 6 flying.
Whimbrel - 1

MC-290 MOORE ISLANDS 103 A/11

Location: West of Kettle Inlet on the northern end of Aristazabal Island. 52°40'N 129°25'W

All the islets along the west side of the two large Moore Islands, including those between the main Moore and the main Whitmore Islands, have been included in the Moore Islands group (Fig. MC290-2).

Land status: The large, northern island is an Indian Reserve, and the south island and the small islets along its west side are part of Ecological Reserve No. 23.

Date of visit: 17 May to 6 June (base camp), and 20 June 1988. Transects on the main islands were done on 26, 27, 28 and 31 May, and on the western islets on 4 June. Rhinoceros Auklet burrow occupancy was determined on 2 and 4 June, and gulls were censused on 20 June.

Colony access: Landings on beaches and mudflats in protected bays on main islands; drop-off from boat for small islets.

Base camp: There is a good campsite with a stream in the northwest facing bay on the mid-west side of the main north island.

Observers: M. Lemon, M. Rodway, B. Carter, M. Force, D. Grinnell, M. Grinnell.

Census method: Strip transects: 114 transects, 2 m wide and 200 m apart, on the main north and south islands for Rhinoceros Auklets (Fig. MC290-1); 30 quadrats, 2x2 m, at 15 m intervals along 8 line transects spaced 100 m apart on the western chain of islets for storm-petrels and auklets (Fig. MC290-2); and total count for oystercatchers and gulls. We ran a transect across islet #2 of the Whitmore Island group (Fig. MC310-1) and included that sample with the rest of the transects in the calculations of burrow density for storm-petrels and Rhinoceros Auklets on the western chain of islands. Population estimates for that islet were listed for Whitmore Island (see below). Line transects were run across the western islets at parallel bearings of 270° and transects 1 to 8 were 32.4, 19.0, 66.6, 74.3, 83.4, 75.0, 44.5 and 29.5 m long, respectively. Occupancy for Rhinoceros Auklets was determined in a single plot located on the north side of islet 2 (Fig. MC290-1) and no standard error for the occupancy rate could be calculated. Our survey was too early in the breeding season for Leach's Storm-Petrels to determine an overall occupancy rate for storm-petrels.

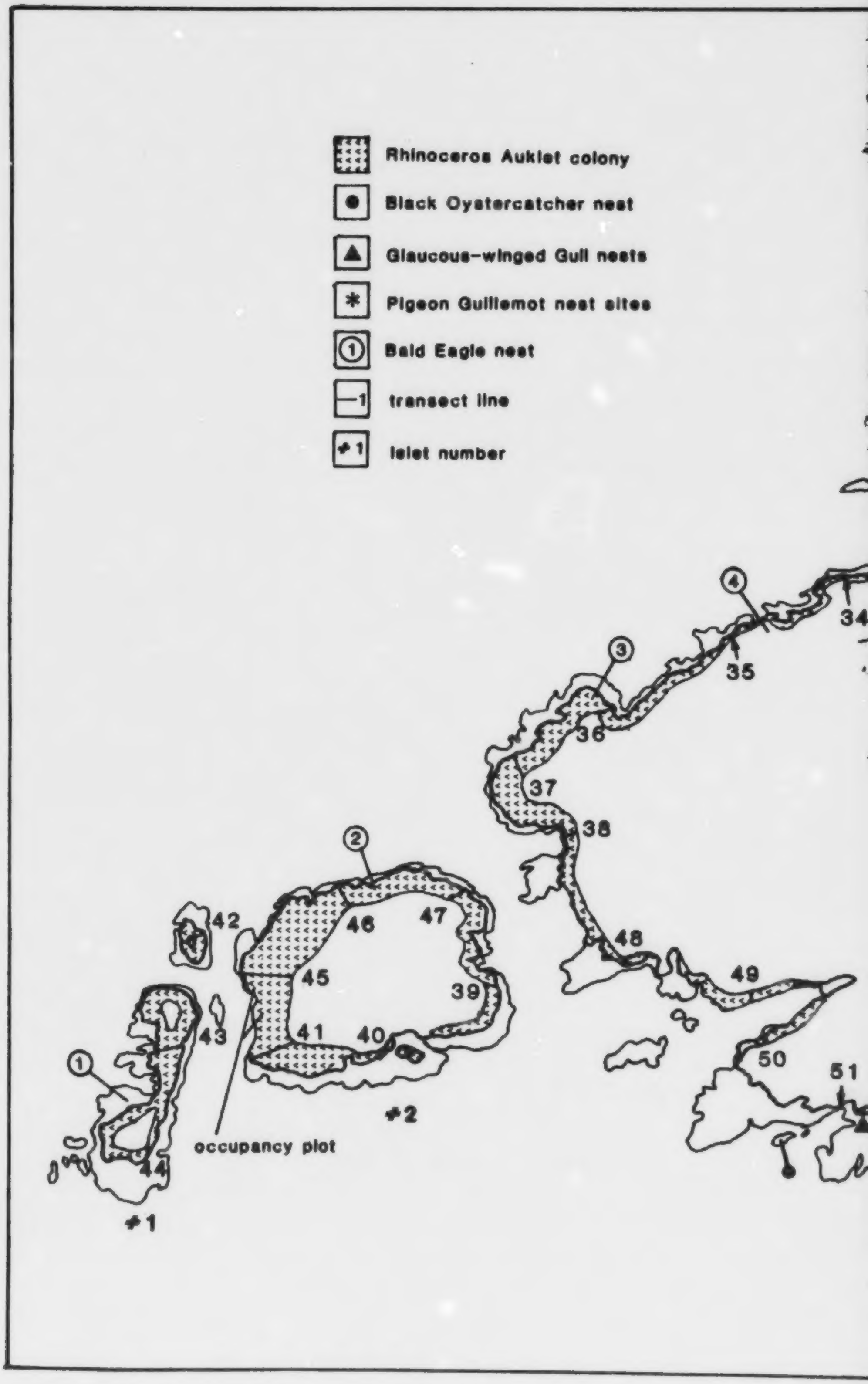
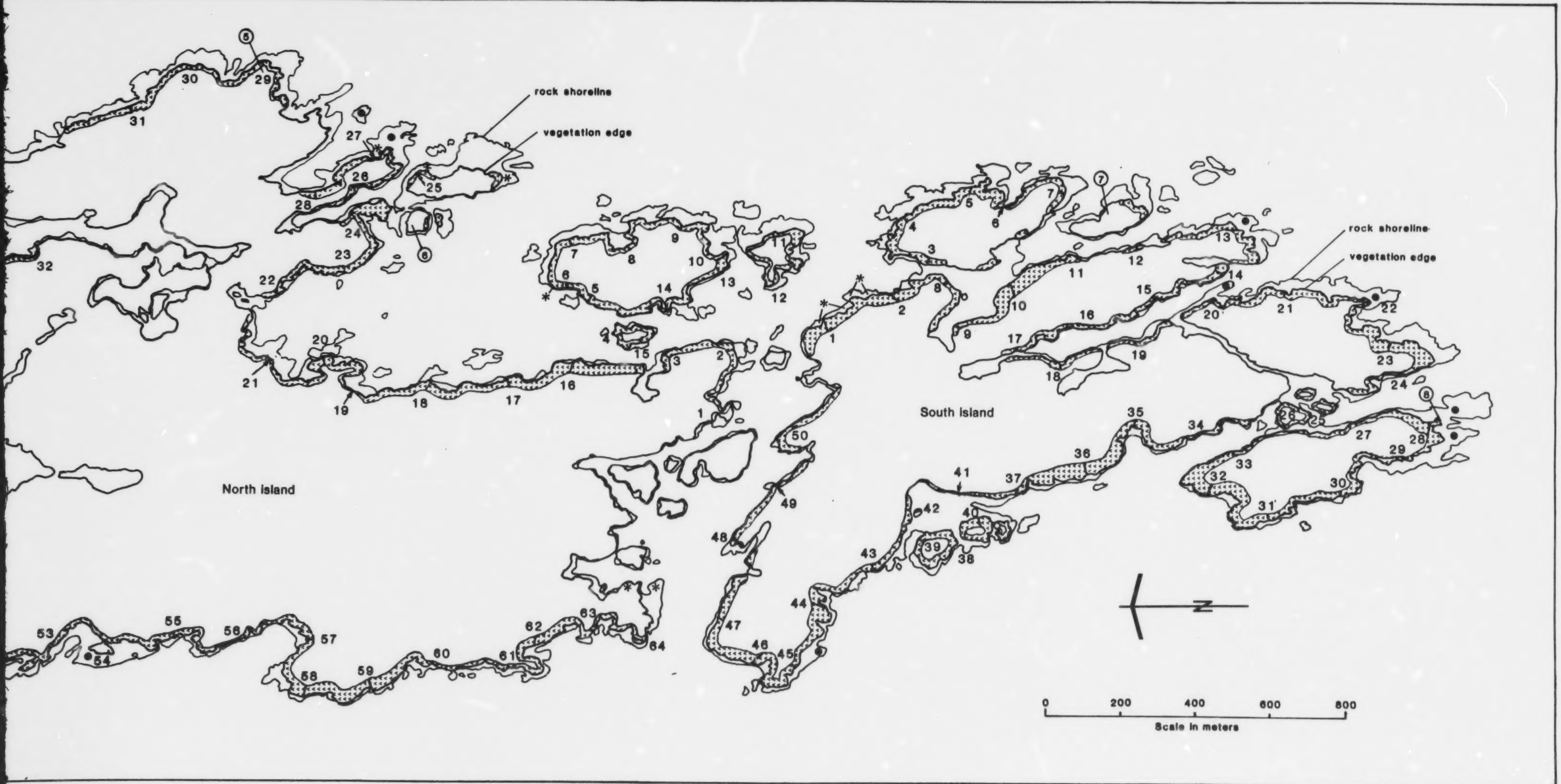


Figure MC290-1. Seabird colony areas and transect locations on the ma



lands in 1988.

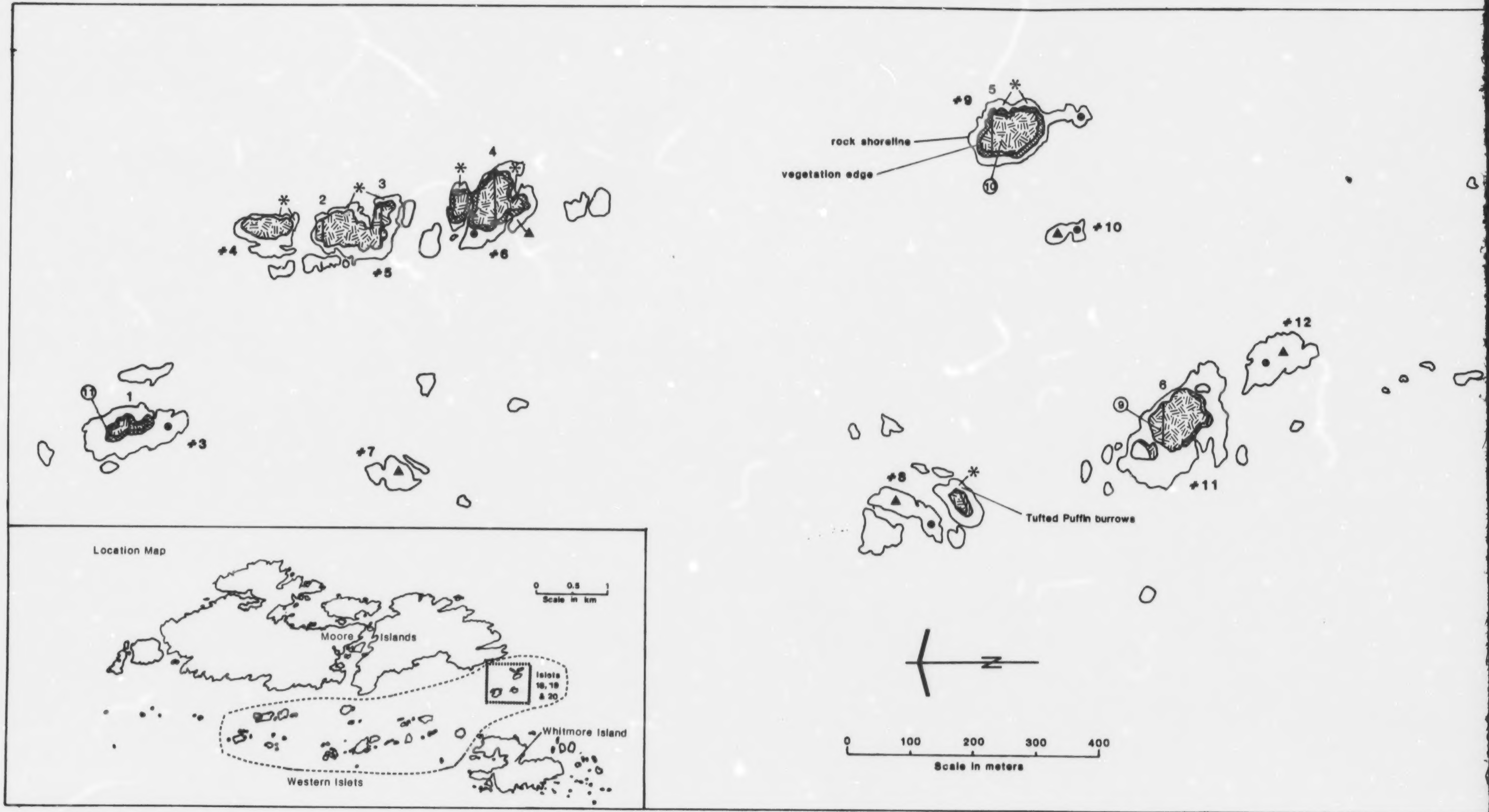
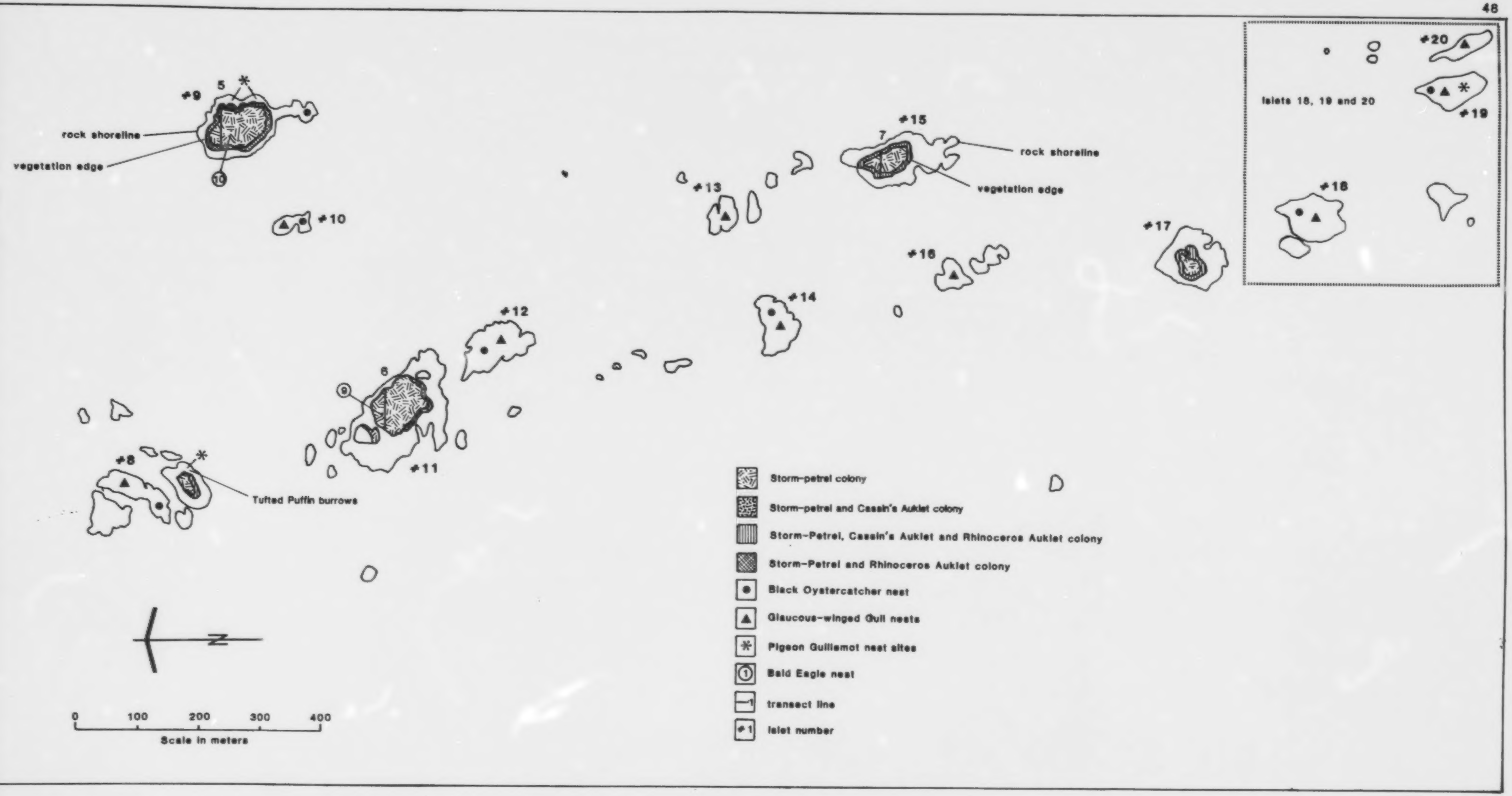


Figure MC290-2. Seabird colony areas and transect locations on the western islets of the Moore Islands in 1988


#9
5
rock shoreline
vegetation edge
10
#10
#13
#15
7
rock shoreline
vegetation edge
Islets 18, 19 and 20
#20
#19
#18
#17
#16
#14
#12
6
9
#11
#8
Tufted Puffin burrows
Storm-petrel colony
Storm-petrel and Cassin's Auklet colony
Storm-Petrel, Cassin's Auklet and Rhinoceros Auklet colony
Storm-Petrel and Rhinoceros Auklet colony
Black Oystercatcher nest
Glaucous-winged Gull nests
Pigeon Guillemot nest sites
Bald Eagle nest
transect line
islet number
N
0
100
200
300
400
Scale in meters

Description: The Moore Islands are low and gently undulating, except for a few steep portions along rocky perimeters. They rise to maximum elevation of 58 m, and have a total area of 427 ha, 291 ha on the north island, 125 ha on the south island, and 10.8 ha on the western chain of islets. The shoreline of the large islands is convoluted with many shallow bays and tidal channels. There are small lakes and extensive sphagnum bogs in the interiors. Spruce is the dominant tree on perimeters of the large islands, and on all small, treed islets. Hemlock and redcedar are more common inland, and dwarf pine grow around interior bogs. Open areas of moss, grass, Maianthemum and other forbs are frequent along edges and over much of the small islets. Thickets of salmonberry or salal often border herbaceous areas, becoming extensive along shore in some areas, epecially at the heads of inner bays. Tall elderberry, huckleberry and salmonberry occur in sparse stands over mossy slopes at the north end of the largest island and on the north side of islet 2. Bare litter covers the forest floor in interior areas. Smaller western islets are bare rock with little vegetation.

Nesting species:

Storm-Petrel: Both Fork-tailed and Leach's storm-petrels were nesting on the chain of islets along the west side of the Moore Islands (Table MC290-1; Fig. MC290-2). Burrows were located primarily in grass and Maianthemum habitat. The length of burrows averaged 62.3 ± 4.8 cm (n = 26). Fork-tailed Storm-Petrels were incubating eggs at the time of our survey. Leach's Storm-Petrels had not yet laid eggs (Table MC290-2). One Fork-tailed Storm-Petrel was heard calling around our camp on 19 May between 2300 and 2330 h and at 2400 h on 23 May and Leach's Storm-Petrels were heard calling from burrows. Sample plots include those from the transect run across islet #2 in the Whitmore Islands.

1988 Population estimate:

Number of sample plots:	30 (120 m^2 - 0.3% of colony)
Average density:	4250 ± 1018 burrows/ha
Colony area:	3.8 ha
Total burrows:	16,278 ± 3899
1988 Occupancy rate:	not determined

1988 Nesting population: Using median occupancy rate for British Columbia of 91% (Rodway et al. 1988) and the proportion of Fork-tailed Storm-Petrels determined on this survey (Table MC290-2):

Fork-tailed Storm-Petrel:	8862 ± 2123 pairs
Leach's Storm-Petrel:	5951 ± 1425 pairs

Table MC290-1. Number of storm-petrel burrows in 2x2 m plots along transects on the west islets of the Moore Islands in 1988. Transect 8 was run on islet 2 in the Whitmore Islands.

	Transect							
Plot	1	2	3	4	5	6	7	8
1	0	1	3	2	0	3	0	0
2	1	4	10	1	1	0	1	0
3	0		2	2	0	1	5	
4			2	2	0	3		
5			6	1	0	0		

Table MC290-2. Occupancy of storm-petrel burrows on the west islets of the Moore Islands on 4 June 1988.

Location Transect	Plot	Empty	Fork-tailed Adult +egg	Leach's Adult	Cold egg
2	1	1			
2	2		1		1
3	1				1
3	2		1		1
3	3	2			
3	5		1		1
pesticide plot[a]		3			1
4	1				1
6	1		1		1
6	3			1	
6	4	1	2		
7	2	1			
7	3	1	3	1	
Total		9	9	2	7

[a] burrows were explored to collect eggs for pesticide analysis.

Black Oystercatcher: We found 16 nests and suspected nesting by 5 other pairs of oystercatchers (Table MC290-3; Fig. MC290-1,2). Most nests were made of shell pieces on rock, three were bare dirt bowls with a few shells. Shells used included mussel, limpet, abalone, red turban shells and opercula, chiton, and periwinkle.

Table MC290-3. Black Oystercatcher nests on Moore Islands in 1988.

Location	Date	Emp	1E	2E	3E	Sus	Total
North island:							
Near tran. 51	28 May		1				1
Near tran. 54	27 May			1			1
Near tran. 27	31 May			1			1
Rock off tran. 27	31 May		1				1
South island:							
S of tran. 45	28 May					1	1
Near tran. 20	22 May					1	1
Near tran. 13	22 May	1					1
Near tran. 22	28 May		1				1
Near tran. 28	28 May				1		1
Near tran. 29	28 May		1				1
Western islets:							
3	24 May					1	1
6	24 May			1			1
8	20 Jun		1				1
9	24 May		1				1
10	20 Jun			1			1
12	20 Jun	1					1
13	20 Jun			1	1		2
14	20 Jun	1					1
18	20 Jun					1	1
19	20 Jun					1	1
Total:		3	6	5	2	5	21

Glaucous-winged Gull: Gulls were nesting on the western chain of islets (Fig. MC290-2; Table MC290-4). We counted a total of 150 nests on 20 June. Nests were built of grass with some seaweed and twigs in a few nests. Gulls were still laying eggs when we conducted the census, only 20% of nests had full clutches. We found 5 depredated eggs.

Table MC290-4. Glaucous-winged Gull nests on Moore Islands in 1988.

Islet	Start	Empty	1E	2E	3E	4E	Total
N. main	1						1
6		1	1		2	1	5
7			2	2	2		6
8	5	10	4	8	8		35
10		1					1
12	3	4	2	4	2		15
13		2		2	5		9
14		4	3	2	4		13
16	1	2		3			6
18	2	5	3	9	1		20
19	3	18	8	3	4		36
20			1	1	1		3
Total	15	47	24	34	29	1	150

Pigeon Guillemot: We counted a total of 187 guillemots around the Moore Islands during our stay. Various areas were surveyed on different dates and the total is the sum of the maximum numbers seen at each location (Table MC290-5). Guillemots were nesting in rock crevices and burrows at the edge of the vegetation above steep shore rock.

Table MC290-5. Pigeon Guillemots counted around the Moore Islands in 1988. Numbers are the maximum counted at each location.

Location	Date	Number
North island:		
Mouth of NE lagoon	June 11	50
SW corner	May 18	21
E side	May 31	2
South island:		
NE corner	May 31	21
West islets:		
4-6	June 4	40
8	May 24	15
9	May 23	27
11	June 4	9
19	June 4	2
Total		187

Cassin's Auklet: Small numbers of Cassin's Auklets were nesting on the western islets (Fig. MC290-2). We identified no Cassin's Auklet burrows within surveyed quadrats along transects and breeding populations were estimated from observations made during explorations. Burrows were most numerous on islets 8, 15 and 17; small numbers were seen on islets 3, 6 and 11. Most burrows occurred in grassy, perimeter areas. A total of 500 burrows were estimated, and, using the average occupancy rate of 75% (Rodway et al. 1988), we estimated a breeding population of 400 pairs.

We encountered 1 Cassin's Auklet on the water at 0930 h on 4 June between Moore and McKenney islands.

Rhinoceros Auklet: Rhinoceros Auklets were nesting around most of the perimeters of the main islands (Fig. MC290-1) and on the larger western islets (Fig. MC290-2). Burrows extended as far as 70 m inland on the north end of islet 2, but generally burrowing extended less than 30 m, and often less than 10 m from shore (Tables MC290-6,7). They were most abundant on raised knobs or higher slopes above steep shore rock in moss, Maianthemum or bare litter habitat under tree roots or logs. Adults were present in 23 of the 30 burrows whose contents were determined. We confirmed eggs in 18 of the occupied burrows; in the other 5 we only reached adults. Nest cup materials were recorded in 16 burrows: twigs and lichens were most common (10 burrows), grass, moss, and bark occurred in 3 burrows, and 3 burrows had no nest materials, eggs being laid on bare earth. The average length of burrows was 166.2 ± 9.7 cm (n = 29).

No large groups of staging birds were seen around Moore Islands: 20 were seen on 17 May and 37 were seen on 6 June northeast of Moore Island. From camp on the west side of the north island, birds were heard flying in and out between 2300 h and 2330 h on 18 May and a chorus was heard between 0400 and 0430 h on 24 May.

1988 Population estimate:

Main islands including islets 1 and 2:

Number of sample strips:	113 (2936 m^2 - 1.0% of colony)
Average density:	1757 ± 126 burrows/ha
Average width of colony:	13.0 ± 1.1 m
Perimeter length of colony:	22,552 m
Colony area:	29.3 ± 2.5 ha
Total burrows:	51,511 ± 5699
1988 Occupancy rate:	77% (23 of 30 known)
1988 Nesting population:	39,663 ± 4388 pairs

Western islets:

Number of sample plots:	7 (28 m^2 - 0.4% of colony)
Average density:	1429 ± 743 burrows/ha
Colony area:	0.8 ha
Total burrows:	1129 ± 587
1988 Occupancy rate:	77% (from main islands)
1988 Nesting population:	869 ± 452 pairs

Total population estimate:	40,500 pairs

Table MC290-6. Number of Rhinoceros Auklet burrows in 5 m sections along 2 m wide transects on the main islands of the Moore Islands in 1988.

North islands:	Transect										
	1	2	3	4	5	6	7	8	9	10	11
Bearing (°)	70	329	225	155	113	99	257	259	321	322	44
Section											
1	0	0	4	1	3	5	1	1	2	0	1
2		1	4	2	0	0	3	1	0	1	1
3		0	1	0	1		1		1	0	2
4				0						2	
5										2	
6										3	
7										1	
Total burrows	0	1	9	3	4	5	5	2	3	9	4
Extent (m)	0	13.5	14.1	16.5	13.0	9.8	13.0	8.5	10.7	31.7	12.0

North islands:	Transect										
	12	13	14	15	16	17	18	19	20	21	22
Bearing (°)	100	62	56	57	290	250	304	291	250	312	82
Section											
1	0	3	1	6	1	4	2	0	1	0	4
2		2	0	2	3	2	3		0		1
3			0		1	2	1		0		
4					2	0	0		0		
5					0	0	0				
Total burrows	0	5	1	8	7	8	6	0	1	0	5
Extent (m)	0.5	10.0	18.0	6.9	24.8	21.0	21.4	0	16.5	0	8.6

North islands:	Transect										
	23	24	25	26	27	28	29	30	31	32	33
Bearing (°)	90	292	170	99	253	269	251	273	248	230	98
Section											
1	4	4	0	0	0	4	5	2	5	3	0
2	3	1				3	3	1	0	0	4
3	0	0				1			1		
4	0					1					
Total burrows	7	5	0	0	0	9	8	3	6	3	4
Extent (m)	15.3	13.0	0	2.5	0	20.0	10.5	6.5	13.4	6.3	8.5

Table MC290-6. (cont'd)

North islands:	Transect										
	34	35	36	37	38	39	40	41	42	43	44
Bearing (°)	280	210	344	246	156	17	50	159	342	164	52
Section											
1	0	0	6	6	0	1	2	6	6	2	7
2			4	3	0	0		1	4	3	
3			2	3		2		2	5	0	
4			0	2				0	6	1	
5				2				0		1	
6				1				2			
7				1				0			
8								1			
9								1			
10								4			
11								0			
12								3			
Total burrows	0	0	12	18	0	3	2	20	21	7	7
Extent (m)	1.0	0	20.0	36.0	13.0	17.5	4.2	62.0	17.0	25.0	4.0

North islands:	Transect										
	45	46	47	48	49	50	51	52	53	54	55
Bearing (°)	180	240	332	110	83	U[a]	-	112	62	100	94
Section											
1	4	4	4	1	5	3	-	5	0	0	4
2	7	5	2		1	1			0	0	0
3	2	2	5		3						0
4	5	0	6								
5	4	0	1								
6	2	0									
7	3	0									
8	0										
9	3										
10	1										
11	1										
12	1										
13	0										
14	0										
15	1										
Total burrows	34	11	18	1	9	4	-	5	0	0	4
Extent (m)	70.5	33.0	25.0	0.5	14.5	6.0	-	6.0	8.0	0	12.0

Table MC290-6. (cont'd)

North islands:	Transect								
	56	57	58	59	60	61	62	63	64
Bearing (°)	50	173	102	70	102	140	99	15	20
Section									
1	7	1	5	2	0	4	3	2	1
2		0	0	1		0	1		0
3		0	2	0			2		1
4			0	0			1		0
5			0				0		1
6									1
Total burrows	7	1	7	3	0	4	7	2	4
Extent (m)	3.0	13.5	22.8	19.0	1.0	8.0	23.5	3.7	26.0

South islands:	Transect										
	1	2	3	4	5	6	7	8	9	10	11
Bearing (°)	249	230	94	231	291	340	7	335	218	250	287
Section											
1	0	0	1	0	4	0	1	0	3	2	2
2	0	0	0	1	3		0	0	0	1	0
3	0	0	1		2		0			0	
4	3	1			2					1	
5	1	0			2					0	
6	0									0	
Total burrows	4	1	2	1	13	0	1	0	3	4	2
Extent (m)	28.0	20.5	10.2	8.0	25.0	0	14.0	8.0	7.3	27.3	8.0

South islands:	Transect										
	12	13	14	15	16	17	18	19	20	21	22
Bearing (°)	283	255	25	42	74	79	265	234	312	260	351
Section											
1	3	1	4	1	1	1	4	3	1	4	4
2	3	0	2		0		1		1	1	1
3			1						1	1	0
4			1								1
Total burrows	6	1	8	1	1	1	5	3	3	6	6
Extent (m)	8.8	10.0	16.0	3.5	2.7	3.2	10.0	2.2	12.7	11.0	16.0

Table MC290-6. (cont'd)

South islands:	Transect										
	23	24	25	26	27	28	29	30	31	32	33
Bearing (°)	287	90	121	90	266	280	97	76	76	114	260
Section											
1	2	4	2	2	0	1	0	4	0	1	0
2	2					0		1	1	2	1
3	0					0		2	2	1	
4	1					0				1	
5	1					0					
6						1					
Total burrows	6	4	2	2	0	2	0	7	3	5	1
Extent (m)	23.5	4.5	1.9	2.0	1.0	28.3	1.0	12.0	13.3	35.0[b]	8.0

South islands:	Transect										
	34	35	36	37	38	39	40	41	42	43	44
Bearing (°)	90	96	73	93	88	214	248	100	342	76	24
Section											
1	0	3	0	2	5	3	2	0	1	3	6
2		2	0	3	2	1	1		1	1	3
3		0	0		0		2			1	0
4		0	0				1				1
5			0								2
6			0								2
Total burrows	0	5	0	5	7	4	6	0	2	5	14
Extent (m)	1.0	18.0	29.0	10.0	11.5	10.0	20.0	0	8.0	10.6	30.0

South islands:	Transect					
	45	46	47	48	49	50
Bearing (°)	55	138	212	190	232	238
Section						
1	6	4	3	0	0	1
2	2	0	0	0		1
3	2	0	0	1		
4		0				
5		2				
Total burrows	10	6	3	1	0	2
Extent (m)	11.0	28.0	15.0	11.0	0	10.0

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[a] Not recorded.

[b] Burrows extended above cliff and the area was considered too dangerous to sample.

Table MC290-7. Number of Rhinoceros Auklet burrows in 2x2 m plots along transects on the west islets of the Moore Islands in 1988. Plots considered outside the colony are indicated by a dash.

	Transect							
Plot	1	2	3	4	5	6	7	8
1	0	-	1	0	0	-	2	1
2	-	-	-	-	-	-	-	-
3	0		-	-	-	-	-	
4			-	-	-	-		
5			-	-	-	-		

Tufted Puffin: Three Tufted Puffins flew off the southeast side of islet #8 on 24 May. We found 5 large burrows, one with very fresh droppings at the entrance, at that location. The birds joined another 3 puffins on the water beside the islet. We estimated 3 pairs nesting.

Predation: Evidence of predation within colony areas was minimal and we did not attempt to calculate an overall predation estimate from transect samples. We kept records of all evidence of predation encountered during exploration and transecting of Moore Islands: 49 feather piles of Rhinoceros Auklets were found, as well as 4 pairs of wings, 10 single wings and 9 depredated carcasses, 6 of which were everted. In addition to Rhinoceros Auklets, the remains of other nesting species included 1 entire carcass, 1 decapitated carcass, 1 wing pair, and 1 single wing of Cassin's Auklet, 4 feather piles and 22 wings of Fork-tailed Storm-Petrels, and 2 feather piles and 10 wings of Leach's Storm-Petrels. Remains of other species found included the skeleton and belly feathers of a Red-necked Grebe, 1 feather pile of a Green-winged Teal, 3 feather piles and 1 pair of wings of White-winged Scoter, and 1 feather pile of a Northwestern Crow.

Associated species:

Brandt's Cormorant - 2 on islet #7 on 20 June.

Pelagic Cormorant - 1 seen on 18 May, 4 on 29 May, and 1 on 6 June, all in non-breeding plumage.

Bald Eagle - Large numbers were seen repeatedly around the north end of the island: 24 were flying and perched on the north islets on 18 May, most of which were subadults and immatures; 30 were observed at a feeding ball on 19 May, 24 on a feeding ball on 22 May, and 30 at a feeding ball on 24 May. One carcass was found on 20 May. Eleven Bald Eagle nests were found, at least 7 of which appeared active:

1. 20 m high in 23 m spruce, 10 m from shore rock. 2 adults excited on 24 May.
2. 30 m high in 35 m spruce, 20 m from shore rock. No activity on 19 May.
3. 25 m high in 1 m dbh spruce. No activity on 19 May.
4. 30 m high in 32 m spruce. No activity on 19 May.
5. 15 m high in 17 m spruce, 8 m from shore rock. No activity on 31 May.
6. 12 m high in 20 m spruce. Adult flew off nest on 31 May.
7. 30 m high in 40 m spruce, 50 m from shore rock. Male and female agitated and calling on 22 May.
8. 18 m high in 25 m tilted spruce, 2 m from shore. 2 adults flying and agitated on 22 May.
9. 20 m high in 23 m spruce, 10 m from shore. 2 adults very concerned on 24 May.
10. 15 m high in 40 m spruce, 15 m from shore rock. 1 adult perched on branch above nest on 24 May.
11. 10 m high in 20 m spruce, 5 m from shore rock. 2 excited adults and 2 downy chicks on 24 May.

Peregrine Falcon - 2 pairs nesting on the island. Both nests were found in trees:

1. 20 m high in the fork of a 45 m spruce tree at the centre of an islet off the southeast corner of the main north island. Both parents were perched nearby on 20 May.
2. 15 m high in a 35 m forked spruce on a small islet off the main north island, 15 m from the edge of vegetation. It was lined with sticks and grey feathers and contained 2 downy chicks on 24 May. The female flew off the nest and the male was flying nearby.

Common Murre - 6 on 17 May and 1 on 4 June.

Marbled Murrelet - 4 on 17 May in breeding plumage; 3 on 24 May (1 in winter plumage, 1 in summer plumage, and 1 molting) and 20 seen on 3 June.

Ancient Murrelet - We found no evidence of nesting by Ancient Murrelets. We saw 3 adults on 17 May northeast of Moore Islands, 8 on 6 June between Moore and Anderson islands, and 17 on 11 June south of Moore Islands.

Northern Saw-whet Owl - Heard calling in the evening of 23 May and 31 May.

Northwestern Crow - Maximum of 5 birds seen. 2 nests found:

1. on ground under salal at extreme north end of islet #1, 7 m from shore. On 24 May the nest contained 3 chicks, not yet fully downed and eyes still closed.
2. 5 m high in small spruce lined with cedar bark and moss. Contained 2 chicks on 31 May with eyes closed and pin feathers out on wings. Adults were scared off nest and calling nearby.

Common Raven - 1 on 17 May and 2 on 22 May.

River Otter - Runs and scats.

Other birds and mammals sighted:

Pacific Loon - 4 on 19 May.

Common Loon - 2 on 22 May and 2 in breeding plumage on 2 June.

Sooty Shearwater - 8 on 17 May and 1 on 4 June.

Harlequin Duck - 6 pair on 28 May around south island; 70, mostly males, around islet #19, 8 around islet #13, and 23 males around islet #7 on 20 June.

Surf Scoter - 1 male on 24 May.

White-winged Scoter - Large flocks were frequently seen off the west side of Moore Islands ranging in size from 30 to a maximum of 163 seen on 24 May.

Common Merganser - 1 female on 22 May.

Greater Yellowlegs - 1 on 17 May.

Wandering Tattler - 2 on 18 May and 2 on 24 May.

Spotted Sandpiper - 1 on 17 May.

Whimbrel - 6 on 24 May and 2 on 27 May.

Red-necked Phalarope - flock of 50+ on 17 May.

California Gull - 2 on 19 May at feeding ball.

Herring Gull - 1 on 24 May.

Belted Kingfisher - 1 on 17 May, 20 May and 22 May.

Rufous Hummingbird
Hairy Woodpecker
Olive-sided Flycatcher

Western Flycatcher
Barn Swallow
Chestnut-backed Chickadee
Brown Creeper
Winter Wren
Golden-crowned Kinglet
Swainson's Thrush
Hermit Thrush
American Robin
Varied Thrush
Orange-crowned Warbler
Townsend's Warbler
Fox Sparrow
Song Sparrow
Dark-eyed Junco
Brown-headed Cowbird
Red Crossbill
Pine Siskin
Evening Grosbeak

Harbour Seal - 4 seen on 24 May.

White-sided Dolphins - 3+ on 17 May.

Porpoise sp. - Remains found on 24 May.

MC-300 McKENNEY ISLANDS 103 A/11

Location: West of Moore Islands. 52°39'N 129°29'W

Land status: Provincial Ecological Reserve.

Date of visit: 25 May and 1 June (exploration), 4 June (transects), 20 June 1988 (gull count).

Colony access: Drop-off from boat.

Observers: M. Lemon, M. Rodway, B. Carter, M. Force, D. Grinnell, M. Grinnell.

Census method: Line transects for main storm-petrel colony area: 15 quadrats, 2x2 m, surveyed at 15 m intervals along 3 transects run across islands 1 and 7 at parallel bearings of 239° (Fig. MC300-1); partial counts for sparse storm-petrel and auklet burrows; and total count for gulls. Line transects 1, 2 and 3 were 47.3, 53.0 and 104.7 m long respectively.

Description: The larger of these low rocky islands are forested with spruce, except the high eastern rock which is bare on its south face, and has lush grass on its north side and top. Islands rise to a maximum elevation of 18 m and have a total area of 28.7 ha, 4.4 ha of which are vegetated. Salmonberry forms dense thickets on most islands, with open patches of grass, forbs and moss occurring near shore. Trees and understory vegetation on the northern island appeared sickly, with many dead snags and recently dead and dying trees. Moss, ferns, Maianthemum and other forbs, and the short scattered salmonberry that comprised most of the ground cover had yellowed leaves and stunted growth.

Trees on the large, middle island in the chain were cut in the past, possibly during the Second World War, as there is telegraph wire and the remains of buildings scattered around. Thick salmonberry and small pockets of young, windswept spruce now cover the island.

Nesting species:

Storm-Petrel: Storm-petrels were nesting on islands 1, 2, 4 and 7 (Fig. MC300-1). Highest density of burrows occurred on the northern and southern portions of island 1 and on the southern portion of island 7 (Table MC300-1). Other areas had sporadic pockets of burrows. Burrows were located under Maianthemum, grass, and stunted salmonberry. They occurred along perimeters on the edge of dense salmonberry. The contents of 12 burrows were determined: 7 were empty, 3 held Fork-tailed Storm-Petrels incubating eggs, 1 held a Leach's Storm-Petrel adult, and 1 had a cold egg. The average length of burrows examined was 66.4 ± 6.8 cm (n = 11).

1988 Population estimate:

Transected sections:

Number of plots:	13 (52 m^2 - 0.3% of colony)
Average density:	2500 ± 490 burrows/ha
Colony area:	1.9 ha
Total burrows:	4671 ± 915

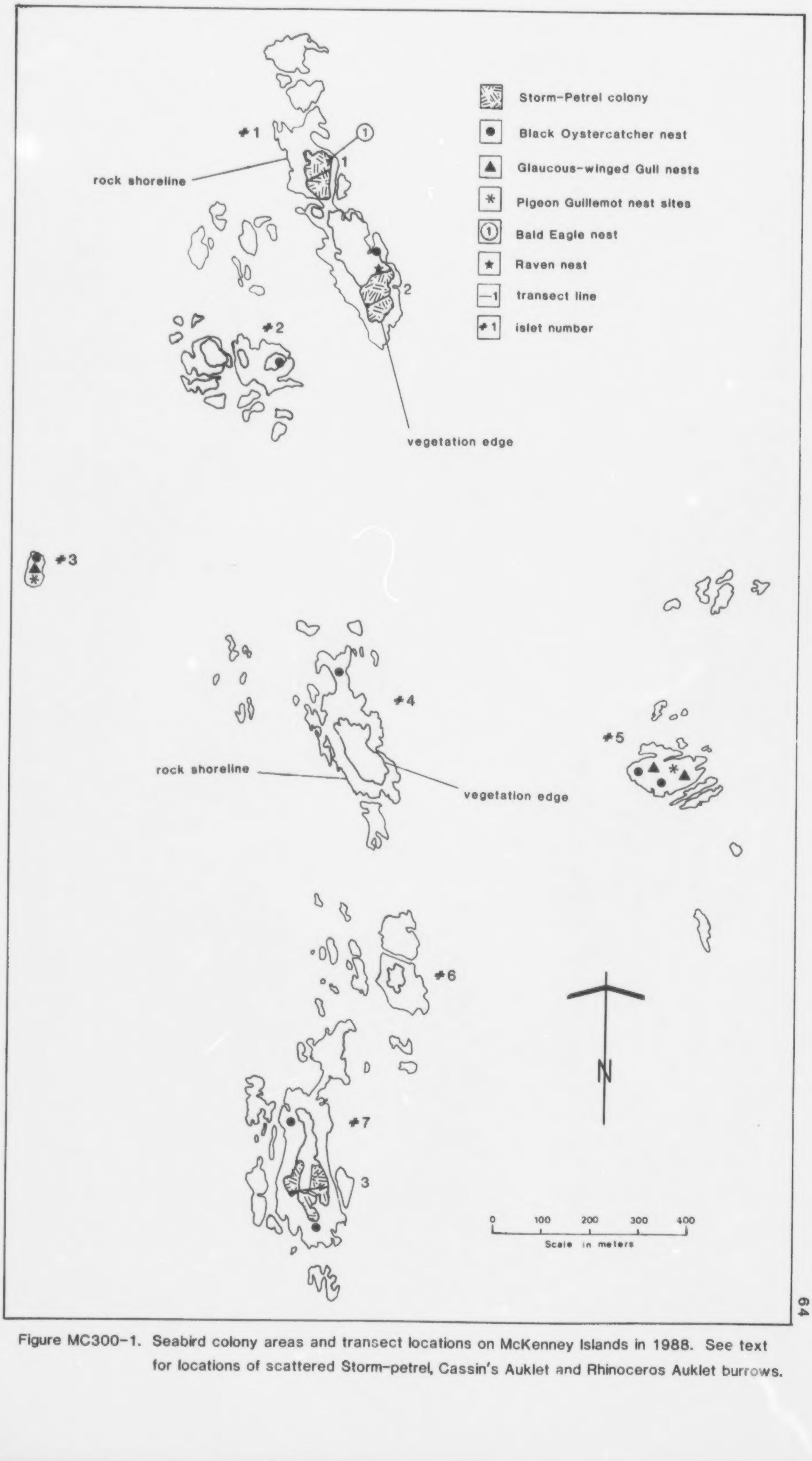

Figure MC300-1. Seabird colony areas and transect locations on McKenney Islands in 1988. See text for locations of scattered Storm-petrel, Cassin's Auklet and Rhinoceros Auklet burrows.

Estimates from partial counts:

Island 1 - mid-east:	50
Island 1 - mid-west:	20
Island 2 - east:	60
Island 2 - middle:	10
Island 2 - west:	10
Island 4:	50
Island 6:	10

Total estimated: 210

Total burrows: 4881 ± 915

1988 Occupancy rate: not determined

1988 Nesting population: Using median occupancy rate for British Columbia of 91% (Rodway *et al*. 1988) and the proportion of Fork-tailed Storm-Petrels determined on this survey (see above):

Fork-tailed Storm-Petrel: 1525 ± 286 pairs

Leach's Storm-Petrel: 2917 ± 547 pairs

Table MC300-1. Number of storm-petrel burrows in 2x2 m plots along transects on McKenney Islands in 1988. Plots considered outside the colony are indicated by a dash.

	Transect		
Plot	1	2	3
1	1	1	0
2	1	2	2
3	2	1	1
4	1	1	0
5			-
6			-
7			0

Black Oystercatcher: We found 6 nests and suspected nesting by two other pairs: empty scrapes on islands 1, 2 and 7; nests with 2 eggs each on islands 3 and 5 (2); and suspected nests on islands 4 and 7 (Fig. MC300-1). Nests with eggs were found on 20 June. One depredated egg was found on 25 May in an area where Common Ravens had been feeding. There were 10 birds on the east rock on 20 June.

Glaucous-winged Gull: We counted 92 gull nests on islands 3 and 5 (Table MC300-2; Fig. MC300-1). Nests were made of grass and Maianthemum, with seaweed in lower nests on island 3.

Table MC300-2. Glaucous-winged Gull nests on McKenney Islands in 1988.

Islet	Start	Empty	1E	2E	3E	Total
3	3	1		3	1	8
5	14	45	8	8	9	84
Total	17	46	8	11	10	92

Pigeon Guillemot: There were 6 birds around island 3 plus 8 on island 5 on 20 June. We found 1 broken egg in a crevice on island 5.

Cassin's Auklet: We found Cassin's Auklet burrows in perimeter areas on the middle and west sections of island 2 (16) and on the southern portion of island 7 (30). One burrow suspected to be a Cassin's Auklet burrow was found on island 1. We estimated 40 pairs of Cassin's Auklets nesting. Breeding was not confirmed. We saw 4 birds off the west side of the islands on 14 June and 9 birds on 20 June north of the islands.

Rhinoceros Auklet: Rhinoceros Auklet burrows were found in perimeter areas on island 1 (25), on the east and middle sections of island 2 (40), on the northwest corner of island 4 (1) and on the south end of the east side of island 7 (100). We estimated 130 pairs of Rhinoceros Auklets nesting. Breeding was not confirmed. We saw 13 birds on 20 June north of the islands.

Predation: During exploration and transecting of McKenney Islands, few signs of predation were found: 4 feather piles and 2 wings of Fork-tailed Storm-Petrels, 1 feather pile of Leach's Storm-Petrel, 1 Sooty Shearwater wing, and 1 Ancient Murrelet wing. There was evidence of gull egg predation on island 5: we found 7 depredated eggs on the ground plus 6 eggs in nests that had freshly pecked holes in them. Many nests were empty. There were five immature and one subadult eagle perched on the rock where most gulls were nesting. One raven was also flying around. We suspected both the eagles and the raven had been preying on gull eggs.

Associated species:

Bald Eagle - 1 adult on 1 June, 1 immature on 3 June, 5 immatures and 1 subadult flying and perched, and 1 subadult with blind eye and bloody foot and bill on island 5 on 20 June. One nest with 2 eggs was found on 25 May on the north island (Fig. MC300-1), 10 m high in a 15 m spruce, 20 m from shore rock. Two adults were excited.

Glaucous-winged-Western Gull Hybrid - 1 adult in breeding plumage on the west side of the northwest rock on 20 June.

Marbled Murrelet - 3 on west side on 14 June and 13 on 20 June on the west side of the northwest rock.

Ancient Murrelet - 1 adult in breeding plumage seen north of McKenney Islands on 20 June.

Tufted Puffin - 1 flying by island 3 on 20 June.

Northwestern Crow - 7 on 25 May, 10 on 1 June. 1 nest found at the north end of the south island, 2 m high in a 3 m spruce, 4 m from shore. The nest was empty and no activity was observed on 1 June.

Common Raven - 1 nest: 10 m high in a 25 m spruce in the centre of the island. 1 recently depredated chick whose feathers were half emerged was found on the ground below the nest. 2 adults were present and excited on 25 May.

River Otter - Runs and scats.

Other birds and mammals sighted:

Pacific Loon - 1 on 20 June to north

Harlequin Duck - 25 birds, mostly males, on the east rock and 2 males on the west side of the northwest rock on 20 June.

Whimbrel - 3 on 1 June and 1 on 20 June.

Winter Wren
Orange-crowned Warbler
Fox Sparrow
Song Sparrow
Dark-eyed Junco

Red Crossbill
Pine Siskin

Harbour Seal - 15 adults and 2 pups on 25 May. 1 adult and 1 pup on 20 June.

MC-310 WHITMORE ISLANDS 103 A/11

Location: Southwest of Moore Islands. 52°37'40"N 129°26'30"W

All small islets east of the main Whitmore Island have been included with Moore Islands (Fig. MC290-2). Islets along the north and south ends of the main Whitmore Islands have been included here (Fig. MC310-1).

Land status: Provincial Ecological Reserve.

Date of visit: 23 May (exploration), 1 June (transects), 5 June (occupancy for Rhinoceros Auklets) and 20 June 1988 (gull count).

Colony access: Boat landings on beaches on east side of main island; drop-off from boat for small islets.

Observers: M. Lemon, M. Rodway, B. Carter, M. Force, D. Grinnell, M. Grinnell.

Census method: Strip transects: 25 transects, 2 m wide and 200 m apart, for Rhinoceros Auklets (Fig. MC310-1); total count for gulls. One line transect was run across islet 2 for storm-petrels in conjunction with transects run on the western islets of the Moore Islands (see Fig. MC290-2). Burrow density was calculated using samples from all the islands (see Moore Islands account). Occupancy for Rhinoceros Auklets was determined in a single plot located on the east side of the eastern peninsula (Fig. MC310-1) and no standard error for the occupancy rate could be calculated.

Description: The topography is gently undulating except along rocky shorelines where small rock bluffs are frequent. The islands rise to 43 m elevation and have a total area of 43.0 ha. Salmonberry and other shrubs form the predominant understory in the interior of the spruce forest, but extensive areas of Maianthemum, moss and grass occur near shore, especially on raised, rocky knolls and exposed slopes. Small swaths of old and recent windfall were encountered.

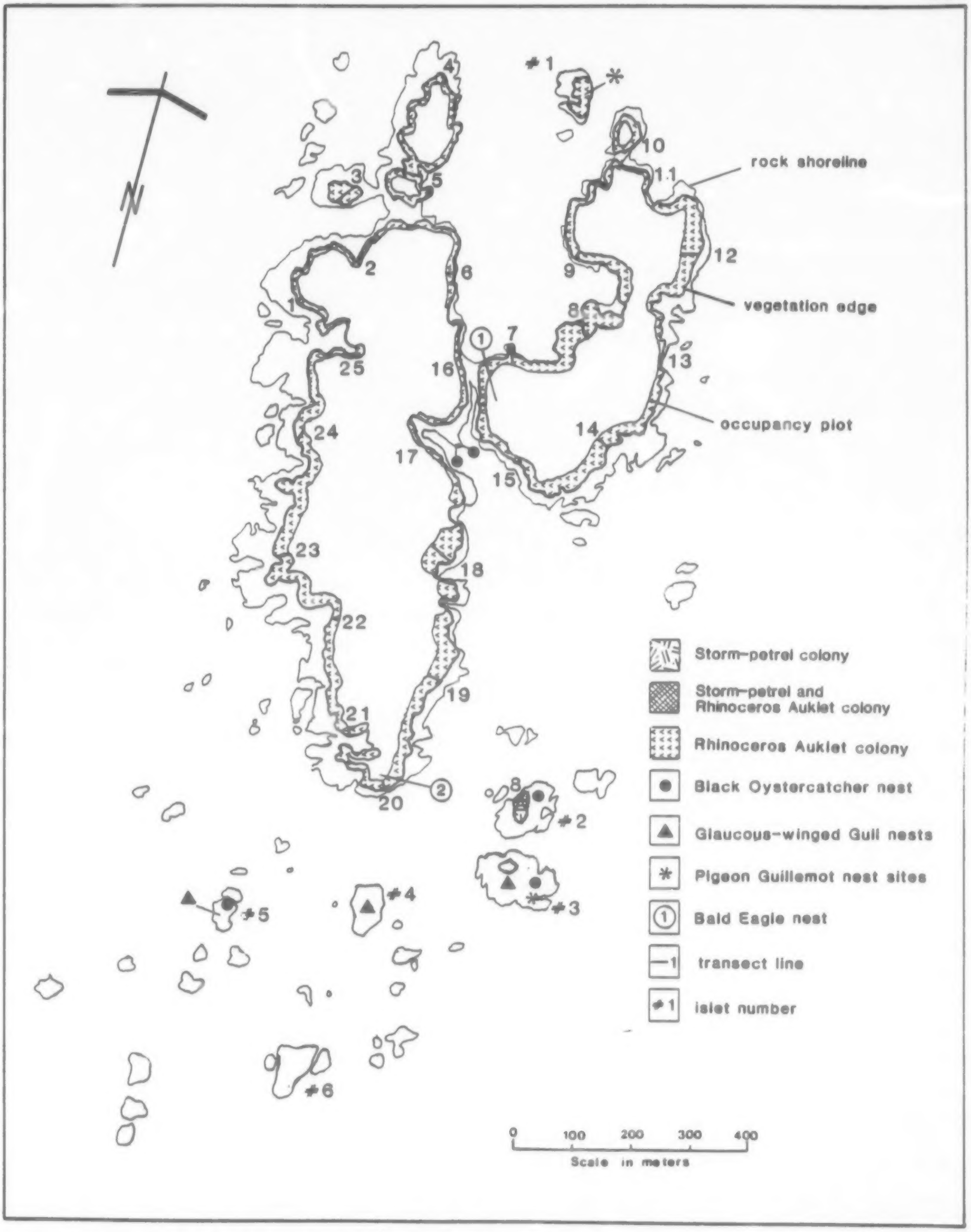

Figure MC310-1. Seabird colony areas and transect locations on Whitmore Islands in 1988.

Nesting species:

Storm-Petrel: Storm-petrels were nesting on islet 2 off the southeast corner of the main island (Fig. MC310-1). Colony areas were sampled with those on the western Moore Islands and the remarks made in that account apply here.

1988 Population estimate:

Number of sample plots:	(see Moore Islands)
Average density:	4250 ± 1018 burrows/ha
Colony area:	0.15 ha
Total burrows:	638 ± 153
1988 Occupancy rate:	not determined

1988 Nesting population: Using median occupancy rate for British Columbia of 91% (Rodway et al. 1988) and the proportion of Fork-tailed Storm-Petrels determined on this survey (see Moore Islands Table MC290-2):

Fork-tailed Storm-Petrel:	342 ± 83 pairs
Leach's Storm-Petrel:	234 ± 56 pairs

Black Oystercatcher: There were 5 oystercatcher nests (Fig. MC310-1): 2 empty nests found on 1 June on a rock in the bay on the south side of the east section of the main island; 1 with 1 egg found on 1 June on islet 2; 1 with 1 egg found on 20 June on islet 3; and 1 with 2 eggs found on 20 June on islet 5. Nests were made of limpet, abalone and chiton shell fragments. One nest was a small grassy bowl with Cochleria pieces.

Glaucous-winged Gull: Gulls were nesting on islets 3, 4 and 5 (Fig. MC310-1), where a total of 19 nests were counted (Table MC310-1). Nests were built of grass, moss and some forbs.

Table MC310-1. Glaucous-winged Gull nests on Whitmore Islands in 1988.

Islet	Start	Empty	1E	2E	3E	Total
3	1	4	4		8	17
4		1				1
5					1	1
Total	1	5	4		9	19

Pigeon Guillemot: Pigeon Guillemots were nesting on islet 1 and 3 (Fig. MC310-1). We counted a maximum of 60 birds: 45 birds flying out of crevices and burrows on the east and southwest sides of islet 1 at 1045 h on 23 May, and 15 birds on islet 3 on 1 June.

Rhinoceros Auklet: Rhinoceros Auklets were nesting around most of the perimeter of the Whitmore Islands, except in low, level ground at the heads of bays (Fig. MC310-1). Burrows extended as far as 45 m inland, but generally burrowing extended less than 30 m, and often less than 10 m from shore (Tables MC310-2). They were most abundant on raised knobs or higher slopes above steep shore rock in moss, Maianthemum or bare litter habitat under tree roots or logs. Some burrows were found under salmonberry and windfall. Adults were present in 18, and cold eggs were found in 2 of the 26 burrows whose contents were determined. We confirmed eggs in 14 of the 18 burrows that held adults; in the other 4 we only reached the adults. Burrows averaged 154.0 ± 13.3 cm in length (n = 26).

1988 Population estimate:

Main islands including islet 1:

Number of sample strips:	25 (810 m^2 - 1.0% of colony)
Average density:	1931 ± 266 burrows/ha
Average width of colony:	16.2 ± 2.6 m
Perimeter length of colony:	5126 m
Colony area:	8.3 ± 1.3 ha
Total burrows:	16,035 ± 3370

1988 Occupancy rate: 77% (20 of 26 known)

1988 Nesting population: 12,347 ± 2595 pairs

Islet 2 (calculated with western Moore Islands):

Number of sample plots: (see Moore Islands)

Average density: 1429 ± 743 burrows/ha

Colony area: 0.03 ha

Total burrows: 46 ± 24

1988 Occupancy rate: 77% (from main islands)

1988 Nesting population: 35 ± 18 pairs

Total population estimate: 12,382 ± 2595 pairs

Predation: During exploration and transecting of Whitmore Islands, most signs of predation were of Rhinoceros Auklets: 20 feather piles, 4 single wings, and 3 carcasses, 1 of which was everted. One wing and 1 feather pile of an unidentified shearwater were also found.

Associated species:

Pelagic Cormorant - 1 on 23 May.

Bald Eagle - 5 immatures, 1 subadult and 2 adults were seen on 23 May. 2 nests were found (Fig. MC310-1):

1. 30 m high in 40 m spruce, 25 m from shore rock. No activity in vicinity on 23 May.
2. 6 m high in 8 m spruce, 30 m from shore. Nest was empty on 23 May. It was located adjacent to the Peregrine Falcon nest.

Peregrine Falcon - 1 nest 20 m high in 30 m spruce, 120 m from shore rock. 1 male was chasing two Bald Eagles on 23 May. There was no activity on 20 June.

Table MC310-2. Number of Rhinoceros Auklet burrows in 5 m sections along 2 m wide strip transects on the main islands of the Whitmore Islands in 1988.

	Transect										
	1	2	3	4	5	6	7	8	9	10	11
Bearing (°)	3	162	321	182	270	264	165	155	359	360	190
Section											
1	6	1	6	1	1	6	4	1	1	0	1
2	0		3	1	0	2	0	0	0		
3			0		0		0	0	0		
4			0		0		1	3			
5			2		1		0	2			
6			0		1		2	0			
7			3					0			
8			3					1			
Total burrows	6	1	17	2	3	8	7	7	1	0	1
Extent (m)	9.0	3.0	37.0	9.5	29.4	10.0	32.0	35.2	14.0	0	3.6

	Transect										
	12	13	14	15	16	17	18	19	20	21	22
Bearing (°)	260	252	300	334	259	214	302	285	330	328	98
Section											
1	3	0	5	7	2	1	6	2	2	3	1
2	2		2	3		0	6	0	0	1	3
3	1		1				3	0	4	0	0
4	4		1				0	2	0		
5	1		0				4	0			
6	3		0				0				
7							4				
8							2				
9							0				
Total burrows	14	0	9	10	2	1	25	4	6	4	4
Extent (m)	29.0	3.0	27.4	8.0	2.5	7.0	45.0	24.8	15.8	12.8	11.0

	Transect		
	23	24	25
Bearing (°)	75	20	182
Section			
1	6	5	0
2	3	7	
3	0	3	
4	0		
5	0		
Total burrows	9	15	0
Extent (m)	21.0	14.0	0

Northwestern Crow - 4 birds were seen on 23 May. 4 nests were found: one empty nest, 6 m high in an 8 m spruce, about 25 m from shore on 23 May; 2 with unknown contents in small spruce trees; and one on the ground on a small, 1 m high mound, with shrubbery extending 0.7 m above the nest. Grass formed the outer cup and the inner cup was made of lichen and moss strands. It contained 4 eggs on 1 June.

River Otter - Runs, piles of abalone shells, scats of fish.

Other birds and mammals sighted:

Common Loon - 2 birds seen south of the island on 20 June, 1 in summer plumage and 1 in winter plumage.

Harlequin Duck - 24, mostly males, on 20 June south of Whitmore.

Whimbrel - 13 flying north on 23 May on the west side of the island.

Rufous Hummingbird
Western Flycatcher
Winter Wren
Golden-crowned Kinglet
Hermit Thrush
Orange-crowned Warbler
Wilson's Warbler
Fox Sparrow
Song Sparrow

MC-320 "LONE" ROCK 103 A/11

Location: East of Byers Islands, north of Sinnett Islets.
52°34'10"N 129°20'30"W

Land status: Provincial Ecological Reserve.

Date of visit: 19 June 1988 (2020-2050 h).

Colony access: Drop-off from boat.

Observers: M. Lemon, M. Rodway, B. Carter, M. Force.

Census method: Total count.

Description: This is an 8 m high bare rock.

Nesting species:

Black Oystercatcher: We suspected nesting by one pair that was excited and territorial, but no nest was found.

Glaucous-winged Gull: There were 20 gull nests (Table MC320-1) built of seaweeds, primarily Fucus and some grass. We found one depredated egg.

Table MC320-1. Glaucous-winged Gull nests on "Lone" Rock in 1988.

Empty	1E	2E	3E	Total
1	8	10	1	20

Associated species:

Tufted Puffin - 1 flying.

Other birds and mammals sighted:

California Gull - 2 in adult plumage except for spots on the tail and 1 second year bird.

Herring Gull - 1 third year bird.

MC-330 BOWDEN ISLANDS 103 A/11

Location: West of Normansell Islands off the mid-west coast of Aristazabal Island. 52°34'N 129°13'W

Land status: Crown land.

Date of visit: 24 June 1988 (1140-1220 h).

Colony access: Drop-off from boat.

Observers: M. Lemon, M. Rodway, B. Carter, M. Force.

Census method: Total count.

Description: The island has a dissected, rocky shoreline with steep bluffs and crevices. It rises to 56 m elevation. There is an extensive rocky promontory at the southwest corner. Salal and salmonberry under spruce cover much of the area, with some open sections of grass and forbs. Some of the new growth of the young spruce had browning tips.

Nesting species:

Black Oystercatcher: No oystercatchers were present.

Glaucous-winged Gull: Gulls were nesting on the southwest rocky point. We counted 18 nests: 1 start, 7 empty, 2 with 1 egg, 3 with 2 eggs, and 5 with 3 eggs. Nests were made of grass with some twigs, forbs, and spruce cones.

Predation: One feather pile and 1 pair of wings of Sooty Shearwater were found.

Associated species:

Bald Eagle - 1 nest on north end of the island, 30 m high in a 33 m spruce with a dead top, 15 m from shore rock. 2 adults were perched above the nest.

Peregrine Falcon - 1 calling from the main portion of the island. Young suspected.

Common Murre - 1 offshore west.

Marbled Murrelet - 2 offshore west.

Rhinoceros Auklet - 37 offshore west between 1000 h and 1110 h.

Common Raven - 1

Mink - Small trails, and some scats of crabshell remains found at the entrance to a burrow, may have indicated the presence of mink.

Other birds and mammals sighted:

California Gull - 1 immature offshore west.
Western Flycatcher

Winter Wren
Golden-crowned Kinglet
Swainson's Thrush
Orange-crowned Warbler
Song Sparrow
Fox Sparrow

MC-340 BYERS ISLANDS 103 A/11

Location: West of Aristazabal Island, south of Moore Islands. 52°33'50"N 129°24'W

Land status: Provincial Ecological Reserve.

Date of visit: 29 May (exploration) 6-13 and 16-24 June 1988 (base camp). Transects were done on 9 June on the west island and 18 June on the east island. Occupancy for Cassin's Auklets was determined on 10 June, and for Rhinoceros Auklets on 11, 12 and 17 June.

Base camp: We camped in the bay on the west side of the west island. Tents had to be placed on platforms as higher tides submerge the beach. We dug a small hole to collect seepage water.

Colony access: Boat landings on beaches on both islands.

Observers: M. Lemon, M. Rodway, B. Carter, M. Force, D. Grinnell, M. Grinnell.

Census method: Line transects: 73 quadrats, 2x2 m, surveyed at 15 m intervals along 15 parallel transects spaced 150 m apart (Table MC340-1; Fig. MC340-1). Total count for gulls and oystercatchers. Occupancy for Rhinoceros Auklets was determined in four plots, and for Cassin's Auklet, in a single plot, all located on the west island (Fig. MC340-1). No standard error for the Cassin's Auklet occupancy rate could be calculated.

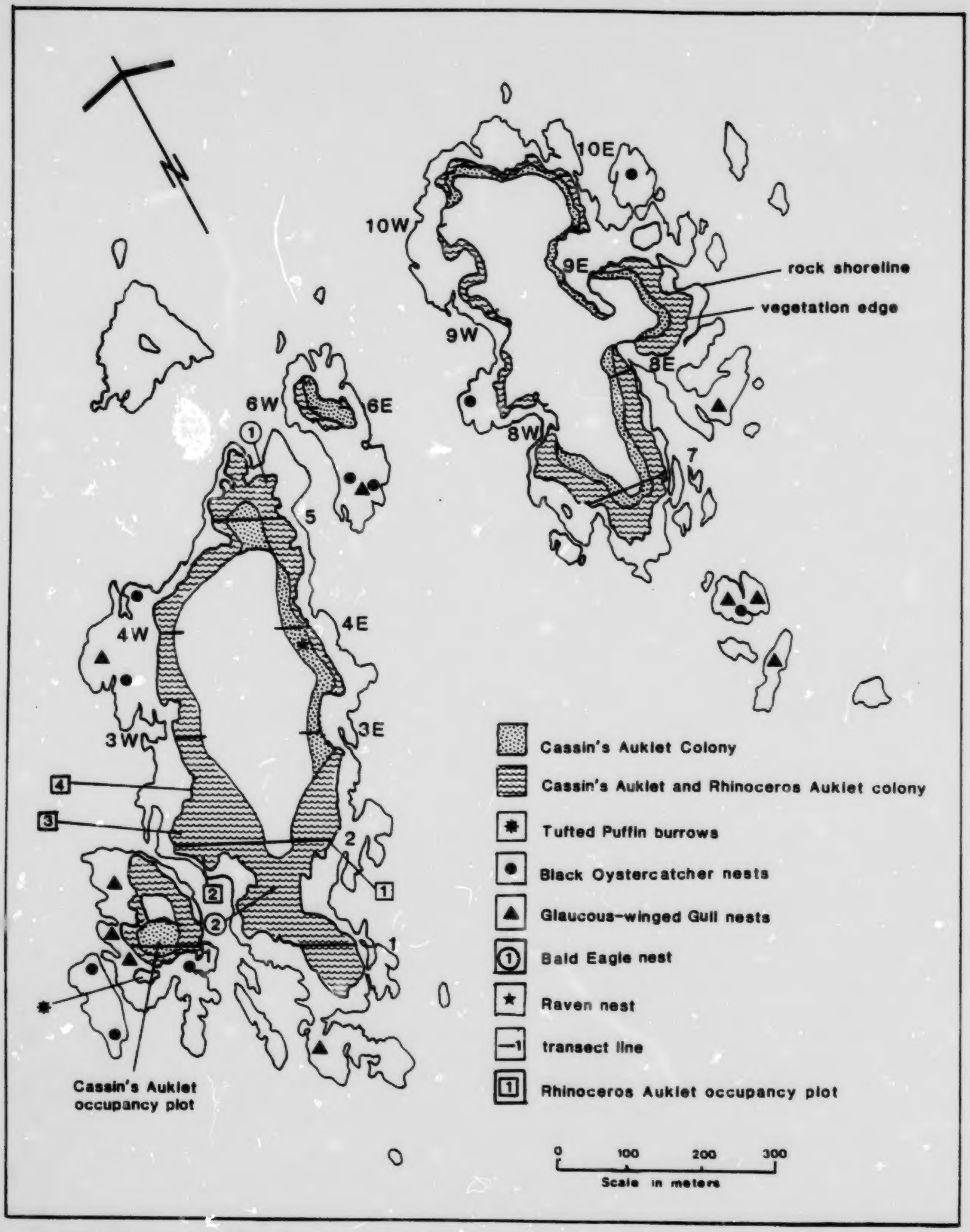

Figure MC340-1. Seabird colony areas and transect locations on Byers Island in 1988.

Table MC340-1. Transect parameters on Byers Islands in 1988.

Transect	Bearing (°)	Total length (m)	Elevation (m) Beg.	End	Max.	Average slope (°)	Range of slope (°)
1	295	176.0	20	18	20	24	10-45
2	115	233.0	3	2	15	16	0-33
3W	115	47.0	4	5	5	6	0-17
3E	295	32.0	1	2	2	3	0-8
4W	115	32.0	4	8	10	29	19-38
4E	295	47.0	2	12	12	11	0-20
5	115	95.1	2	2	5	14	0-25
6	295	70.5	1	3	5	14	0-30
7	274	125.8	5	5	12	17	0-42
8W	94	2.0	1	1	1	0	0
8E	274	32.0	3	8	8	24	10-42
9W	94	17.0	2	3	3	30	27-30
9E	274	10.0	2	2	2	24	24
10W	94	2.0	1	1	1	5	5
10E	274	17.0	4	6	6	27	15-39

Description: These are low, undulating islands with moderate slopes that rise to a maximum elevation of 50 m. The areas of the west and east islands are 20.9 and 11.7 ha respectively. Few steep rocky sections occur on the west side of the west island, where crevices and tidal channels separate outer knobs from the main body of the island. Maianthemum, moss, grass and profuse patches of Saxifraga form open areas near shore, but most of the interior of the islands are dense salmonberry with sporadic elderberry under a spruce forest. There are grassy and rocky knolls at the southwest corner.

In 1988, most of the forest was dead or dying, and silvered snags were more abundant than green trees. Young, 3-5 m spruce are growing in many areas within salmonberry thickets.

Nesting species:

Storm-Petrel: We found no evidence of nesting by storm-petrels. Single Fork-tailed Storm-Petrels were heard calling on 10 June at 0200 h and on 11 June at 2400 h. Single Leach's Storm-Petrels were heard calling from camp on the west island between 2430 and 0136 h on 6 June, 8 June, 10 June and 12 June. Six to 10 birds were heard at 0256 h on 9 June.

Black Oystercatcher: Ten oystercatcher nests were located around the islands (Table MC340-2; Fig. MC340-1). Five nests were worn dirt bowls: two with a few limpet shells, two lined with grass, and one with a few pebbles. Others were made of rock chips and shells on rock.

Table MC340-2. Black Oystercatcher nests on Byers Islands in 1988.

Location	Date	Empty	1E	2E	3E	Total
West island:						
- NE rocks	18 Jun		2			2
- NW rocks	8 Jun	1	1			2
- SW rocks	22 Jun		1	1	1	3
East island:						
- NE corner	29 May			1		1
- W side	29 May		1			1
- S rock	18 Jun			1		1
Total:		1	5	3	1	10

Glaucous-winged Gull: We counted 112 gull nests around Byers Islands (Table MC340-3; Fig. MC340-1). Nests were made of grass with some ferns, sticks and forbs. Two depredated eggs were found.

Immatures were observed roosting in large flocks off the south end of Byers Island on 22 June (181 birds) and 23 June (100 birds). We saw 40 adults and 10 immatures at a feeding ball on 29 May off the northwest corner of the west island, and a flock of 30 individuals, both adults and immatures in about equal numbers, off the west side on 11 June.

Table MC340-3. Glaucous-winged Gull nests on Byers Islands in 1988.

Location	Date	Sta	Emp	1E	2E	3E	4E	Total
West island:								
- NE rocks	18 Jun	1	1					2
- NW rocks	8 Jun	2						2
- SW rocks	22 Jun	1	8	3	5	28	2	47
- S rocks	22 Jun	4	6	2	11	33		56
East island:								
- E side	18 Jun	1						1
- S rock	18 Jun	1	1			2		4
Total:		10	16	5	16	63	2	112

Pigeon Guillemot: We tallied a maximum of 88 birds around the islands (Table MC340-4). Four nests were discovered on the south rocks of the west island on 22 June: 1 with 1 egg and 1 with 2 eggs in burrows and 1 with 1 egg and 1 with 2 eggs in crevices.

Table MC340-4. Pigeon Guillemots counted around Byers Islands in 1988.

Location	Date	Time	Number of birds
West island:			
- N end	29 May	1000	40
- W side	29 May	1000	4
- S rocks	8 Jun	1600	38
East island:			
- S rock	29 May	1000	6
Total:			88

Cassin's Auklet: Cassin's Auklets were nesting in most perimeter areas of both islands, but burrowing was more extensive and abundant on the west island, where it extended as far as 48 m from shore (Tables MC340-5,6; Fig. MC340-1). Most burrows occurred under dead and live tree roots, into banks and open ground, or under mossy deadfall (Table MC340-7). Most burrows examined contained large chicks (Table MC340-8). The average length of a sample of 38 burrows was 99.0 ± 7.3 cm.

Small numbers were regularly seen off the south and west sides of Byers Islands. Highest numbers were 6 birds seen on 8 June off the south end and 8 birds seen on 11 June off the west side. Calls were recorded on the night of 6 June with the earliest at 2330 h; on 7 June a chorus was heard at 0400 h, and on 20 June a few were calling at midnight.

1988 Population estimate:

Number of sample plots:	60 (240 m^2 - 0.2% of colony)
Average density:	1875 ± 427 burrows/ha
Colony area:	11.8 ha
Total burrows:	22,125 ± 5039
1988 Occupancy rate:	85% (29 of 34 known)
1988 Nesting population:	18,806 ± 4283 pairs

Table MC340-5. Extent of Cassin's Auklet and Rhinoceros Auklet colony along transects on Byers Islands in 1988.

	Cassin's Auklet				Rhinoceros Auklet			
		Distance from nearest shore				Distance from nearest shore		
Transect	Dist. along transect (m)	Min. (m)	Max. (m)	Range of elevation (m)	Dist. along transect (m)	Min. (m)	Max. (m)	Range of elevation (m)
1	0-176	0	39	1-20	0-112.5	0	39	1-20
					165-176	0	11	15-18
2	0-127.5	0	40	3-15	0-127.5	0	40	3-15
	172.5-233	0	37	2-10	172.5-233	0	37	2-10
3W	0-32	0	32	4-5	0-32	0	32	4-5
3E	0-20	0	20	1-2	-			
4W	0-19	0	19	4-10	0-19	0	19	4-10
4E	0-32	0	32	2-10	0-7.5	0	7.5	2-3
5	0-95.1	0	47.6	2-5	0-19	0	19	2-5
					69-95.1	0	25.1	2-5
6	0-70.5	0	29	1-5	60-70.5	0	10.5	3-5
7	0-37.5	0	37.5	5-10	0-22.5	0	22.5	5-10
	78-125.8	0	35	5-12	98.5-125.8	0	15	5-6
8W	-				-			
8E	0-36	0	36	3-8	0-25	0	25	3-8
9W	0-8	0	8	2-3	0-8	0	8	2-3
9E	0-8	0	8	2-3	-			
10W	-				-			
10E	0-15.6	0	15.6	4-6	0-10	0	10	4-5

Table MC340-6. Number of Cassin's Auklet burrows in 2x2 m plots along transects on Byers Islands in 1988. Plots considered outside the colony are indicated by a dash.

	Transect														
Plot	1	2	3W	3E	4W	4E	5	6	7	8W	8E	9W	9E	10W	10E
1	0	0	0	1	0	1	0	2	1	-	5	1	1	-	0
2	0	0	0	0	0	0	0	3	1		0	-			0
3	0	0	0	-		1	0	0	1		0				
4	0	0				-	1	0	-						
5	0	0					0	1	-						
6	0	0					2		-						
7	1	0					1		0						
8	0	0							0						
9	3	2							0						
10	4	-													
11	3	-													
12	6	-													
13		0													
14		0													
15		0													
16		3													

Table MC340-7. Habitat locations of Cassin's Auklet and Rhinoceros Auklet burrow entrances along transects on Byers Islands in 1988.

	Cassin's Auklet		Rhinoceros Auklet	
Habitat locations	Number of burrows	Percent of total	Number of burrows	Percent of total
Dead tree roots	9	20	20	28
Into bank	9	20	13	18
Mossy deadfall	6	13	11	15
Live roots	4	9	10	14
Open ground	7	16	6	8
Stump	1	2	5	7
Shrubs	1	2	4	6
Forbs	3	7	1	1
Grass	3	7	0	-
Driftwood	1	2	0	-
Rock	0	-	1	1

Table MC340-8. Occupancy of Cassin's Auklet and Rhinoceros Auklet burrows on Byers Islands in 1988.

Plot	Date	Empty	Cold egg	Adult[a] or chick	Adult + egg	Chick	Hatched eggshell	Total occupied	Total known
Cassin's Auklet:									
	10 Jun	5	2	2	1	24[b]		29	34
Rhinoceros Auklet:									
1	11 Jun			1	4			5	5
2	12 Jun	1		3	1			4	5
3	11 Jun	1		3	9			12	13
4	17 Jun			2	5		1	8	8
Total		2		9	19		1	29	31

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[a] For Cassin's Auklet we were uncertain whether these burrows contained adults or large chicks; for Rhinoceros Auklets, these burrows contained adults, but may also have contained eggs.

[b] One burrow held a dead chick.

Rhinoceros Auklet: As with Cassin's Auklets, we found Rhinoceros Auklets nesting around the perimeters of both islands, most abundantly on the west island, where burrows extended as far as 40 m from shore (Tables MC340-5,9; Fig. MC340-1). Most burrows occurred under dead and live tree roots, into banks, or under mossy deadfall (Table MC340-7). Most burrows examined contained incubating adults. In one burrow we found a recently hatched eggshell (Table MC340-8). The average length of burrows was 154.2 ± 11.4 cm (n = 31).

1988 Population estimate:

Number of sample plots:	41 (164 m^2 - 0.2% of colony)
Average density:	4268 ± 655 burrows/ha
Colony area:	9.5 ha
Total burrows:	40,546 ± 6223
1988 Occupancy rate:	93.5 ± 3.4% (29 of 31 known)
1988 Nesting population:	37,911 ± 5980 pairs

Staging and nocturnal activity: Flocks of Rhinoceros Auklets were seen at all times of the day and aggregations occurred all around the islands within about a 2 km radius. The largest aggregations occurred in the evening. The earliest occurrance of a flock of 1,000 or more was observed at 1600 h on 9 June when 2,000 birds were counted off the east side of the islands. Most large aggregations were recorded around 2000 h: over 1,000 birds were streaming from southeast to northwest past the southwest corner on 9 June at 2000 h; 2,000+ were off the east and south sides and 2,000 were off the west side between 1935 and 2200 h on 11 June; 2000+ were seen south of the islands on 13 June at 2120 h; 1307 birds were gathered to the west and north at 2240 h on 14 June; and 993 were counted to the north at 2000 h on 20 June. Smaller aggregations were observed throughout the daytime: 40+ birds were 1 to 2 miles off the north end around 0930 h, 200+ birds were off the northwest corner at 1230 h, and 50+ birds were south of Byers Islands at 1400 h on 29 May; 150 were scattered between Byers and Moore islands at 0930 h on 11 June; 600 were aggregated off the northwest corner at 1000 h on 13 June; and 112 birds were counted north of Byers Islands at 0915 h on 20 June.

Staging birds generally began flying into the colony around 2315 h. First calls were heard by 0020 h, and chorusing occurred around 0400 h.

Table MC340-9. Number of Rhinoceros Auklet burrows in 2x2 m plots along transects on Byers Islands in 1988. Plots considered outside the colony are indicated by a dash.

	Transect														
Plot	1	2	3W	3E	4W	4E	5	6	7	8W	8E	9W	9E	10W	10E
1	3	5	4	-	3	4	1	-	3	-	2	2	-	-	1
2	3	2	0	-	2	-	0	-	0		1	-			-
3	2	0	0	-	-	-	-	-	-		-				
4	1	1	-			-	-	-	-						
5	0	0					-	2	-						
6	3	6					1		-						
7	1	0					6		-						
8	0	3							0						
9	-	1							0						
10	-	-													
11	-	-													
12	0	-													
13		0													
14		2													
15		2													
16		3													

Tufted Puffin: Small numbers of up to 6 birds were regularly seen off the south and west sides of Byers Islands. Six birds were recorded on 7 and 13 June off the southwest corner of the west island. We found 3 burrows in grass on the south end of the southwest rock. One adult flew into a burrow on 7 June, and one adult was scared out of a burrow on 8 June.

Predation: During exploration and transecting of Byers Islands, few signs of predation were found: 3 feather piles and 1 wing pair of Rhinoceros Auklets; and 4 feather piles and 5 wings of Cassin's Auklets. Observations of prey delivered to the Bald Eagle nest included 2 Rhinoceros Auklets, 1 suspected Rhinoceros Auklet, 1 Sooty Shearwater, and 3 unidentified very small prey items. Observed deliveries to the Peregrine Falcon nest were 1 Cassin's Auklet and 1 Rhinoceros Auklet. Common Ravens were observed digging up burrows and preying on nesting birds.

Associated species:

Double-crested Cormorant - 62 immatures, mostly first year birds, roosting off the west side on 29 May.

Brandt's Cormorant - 1 to 10 birds seen frequently, mostly immature birds.

Cormorant sp. - 40 cormorants on 7 June and 15 on 8 June off the south end of the island.

Pelagic Cormorant - 40+ off the southwest corner of Byers on 7 June, 20 on 8 June. 15 non-breeders on 29 May and 7 non-breeders on 22 June were observed roosting on the south end. Smaller numbers of up to 6 birds were seen periodically off the south and west sides.

Bald Eagle - 3 adults on 22 June, one nesting pair at the nest and another adult flying by. As many as 4 subadults and 3 immatures were seen at one time on 29 May. Two nests were found, one of which was known to be active:

1. 8 m high in a 15 m spruce snag, 20 m from shore. No activity observed on 29 May.
2. 20 m in 25 m spruce snag, 30 m from shore. The first feeding of the young was observed on 7 June and one downy chick was seen.

Peregrine Falcon - 1 pair was nesting on the island. Three chicks were fledged. The nest was 15 m high in a 25 m spruce snag, 30 m from shore. Both parents and 2 chicks were first seen on 6 June. The female was feeding one young on a limb 2 m above the nest and the second young was seen in the nest. On 7 June all three young were perched on the limb above the nest. On 8 June they were hopping around the limbs of the nest tree, and on 11 June they were exploring the ground on the edge of the slope. The three young were flying by 16 June, one with a suspected prey item. The family of 5 was seen daily. By 24 May all 3 young were flying very well.

Glaucous-winged-Western Gull Hybrid - 4 on 8 June, 1 sure and 3 suspected on 23 June.

Common Murre - 1 or 2 birds seen regularly; 3 birds seen on 11 June on the west side of Byers. All were in breeding plumage.

Marbled Murrelet - Between 2 and 22 birds were seen regularly. A group of 16 was off the south coast on 29 May, 22 were off the southwest corner on 7 June, 13 on 9 June and 10 on 11 June were seen off the southeast end of west Byers. All were in breeding plumage.

Ancient Murrelet - A family group of 2 adults and 2 chicks was seen on the water about 8 km northeast of Byers Islands on 11 June at 1400 h. The chicks were half adult size, mostly downy with feathered backs. 12 adults also flew by the same area. Between 1930 and 2200 h, another family group of 2 adults and 1 chick was seen off the west side of Byers Islands. The chick was downy with some feathers on the wings (coverts) and head. The parents dove to feed the chick which stayed on the surface. Most dives did not result in feeding. The chick swam from one adult to the other, intermitently peeping, sometimes swimming directly on an adults tail. There were a few calls by the adults. When the adults surfaced at a distance from the chick and gave a single call, the chick paddled toward them and appeared to be fed. 2 adult birds were also seen flying in the same area. 1 adult was seen off the south end of the west island on 7 June in the afternoon.

Horned Puffin - 1 flying and on the water on 7 June and 1 flying on 18 June off the southwest corner.

Northwestern Crow - Maximum of 6 birds seen on 29 May on the south end of the west island.

Common Raven - A family of 5, 2 adults and 3 young, were regularly observed around camp.

River Otter - Runs and scats.

Other birds and mammals sighted:

Pacific Loon - Small numbers of 2 to 5 birds seen regularly. 91+ birds on 7 June and 80 birds on 8 June were off the south end, and 33 birds on 9 June were seen off the east side.

Common Loon - 2 on 7 June south of Byers Islands, 1 in breeding plumage to the northwest on 11 June, and 1 in incomplete breeding plumage on 20 June to the north.

Red-necked Grebe - 3 on 7 June.

Sooty Shearwater - 25 on 7 June off the south end, 1 on 8 June, and 2 on 11 June.

Short-tailed Shearwater - 17+ on 7 June and 115 on 8 June off the south end, 20 on 9 June at a feeding ball to the southeast, a maximum of 8 at a time on 11 June on the west side, and smaller numbers of up to 3 birds seen regularly.

Shearwater sp - 459 shearwaters observed around 2000 h off the south end on 7 June.

Great Blue Heron - 1 on 29 May.

Harlequin Duck - 1 pair on 29 May, 2 pair on 7 June, 5 males and 1 female on 9 June, and 40 males on 18 June south of east Byers Island.

Surf Scoter - 2 males on 9 June, 1 bird on 20 June.

White-winged Scoter - Large flocks were frequently seen off the south, west, and northwest sides of Byers Islands ranging in size from 30 to a maximum of 230 seen on 11 June.

Common Merganser - 6 males on 7 June.

Killdeer - 1 on 7 June.

Greater Yellowlegs - 1 on 7 June.

Mew Gull - 1 first summer bird on 8 June.

California Gull - Small numbers of immatures and 1 adult on 7 June, 13 immatures on 22 June roosting off the south end, and about 100 birds, 4 of which were adults, roosting on the west and south rocks on 23 June.

Herring Gull - 2 second summer birds on 7 June.

Western Gull - 1 third summer bird on 8 June.

Black-legged Kittiwake - 3 first summer and 1 adult on 8 June, 1 first summer on 20 June and 23 June.

Belted Kingfisher - 1 female.
Rufous Hummingbird
Red-breasted Sapsucker

Western Flycatcher
Chestnut-backed Chickadee
Winter Wren
Golden-crowned Kinglet
Swainson's Thrush
Hermit Thrush
Varied Thrush
Orange-crowned Warbler
Yellow Warbler
Yellow-rumped Warbler
Fox Sparrow
Song Sparrow
Dark-eyed Junco
Red Crossbill - flocks of 10 to 20 regularly seen.
Pine Siskin

Harbour Seal - 1 on 11 June, adult and pup on 18 June.

Northern Sea Lion - 1 young male on 7 June, adult and pup on 18 June.

Killer Whale - 2 males, 2 females and 2 calves on 7 June, at least 3 males and 1 female or young male on 9 June.

MC-350 SINNETT ISLETS 103 A/11

Location: Southwest of Byers Islands, north of Harvey Islands.
52°32'30"N 129°20'06"W

Land status: Provincial Ecological Reserve.

Date of visit: 19 June 1988 (1135-2030 h).

Colony access: Drop-off from boat.

Observers: M. Lemon, M. Rodway, B. Carter, M. Force, D. Grinnell, M. Grinnell.

Census method: Line transects: 21 quadrats, 2x2 m, surveyed at 15 m intervals along 5 transects spaced 75 m apart and run at parallel bearings of 236°; total count for gulls and oystercatchers. Slope and elevation measurements were not taken along transects. Transects 1 to 5 were 51.0, 24.0, 70.4, 88.5 and 54.0 m long respectively. Our survey was too early in the breeding season for Leach's Storm-Petrels to determine an overall occupancy rate for storm-petrels.

Description: Sinnetts are a cluster of small rocky and wooded islets with a total area of 5.2 ha, 2.5 of which are vegetated. Luxuriant forbs, grass and wood fern, alternating with thickets of salmonberry, currant and elderberry, form the understory vegetation of the spruce forest covering most of these islets. Much of the forest on the southwest islet was dead or dying in 1988.

Nesting species:

Storm-Petrel: Storm-petrels were nesting throughout vegetated areas on Sinnett Islets (Table MC350-1; Fig. MC350-1). Burrows were located primarily under mossy deadfall, in open ground, and under Maianthemum (Table MC350-2). The length of burrows averaged 66.6 ± 3.3 cm (n = 45). Fork-tailed Storm-Petrel chicks were hatching at the time of our survey. Leach's Storm-Petrels were incubating or laying eggs (Table MC350-3).

1988 Population estimate:

Number of sample plots:	21 (84 m^2 - 0.3% of colony)
Average density:	13,571 ± 1879 burrows/ha
Colony area:	2.5 ha
Total burrows:	33,385 ± 4622
1988 Occupancy rate:	not determined

1988 Nesting population: Using median occupancy rate for British Columbia of 91% (Rodway et al. 1988) and the proportion of Fork-tailed Storm-Petrels determined on this survey (Table MC340-2):

Fork-tailed Storm-Petrel:	19,158 ± 2652 pairs
Leach's Storm-Petrel:	11,222 ± 1554 pairs

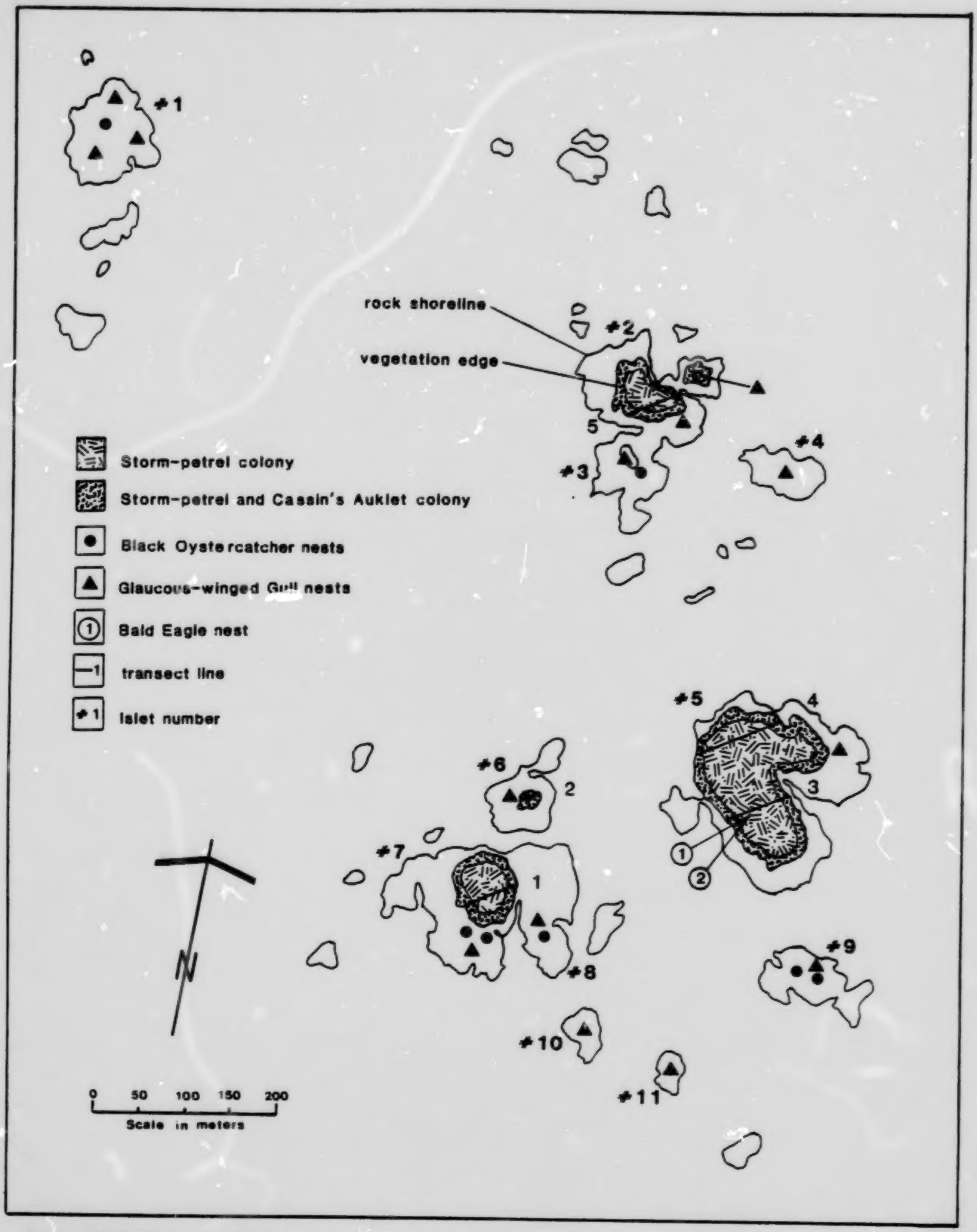

Figure MC350-1. Seabird colony areas and transect locations on Sinnett Islets in 1988.

Table MC350-1. Number of storm-petrel burrows in 2x2 m plots along transects on Sinnett Islets in 1988.

	Transect				
Plot	1	2	3	4	5
1	8	1	0	9	2
2	3	1	4	7	4
3	4		4	10	1
4	10		10	6	4
5			10	7	
6				9	

Table MC350-2. Habitat locations of storm-petrel burrow entrances along transects on Sinnett Islets in 1988.

Habitat location	Number of burrows	Percent of total
Mossy deadfall	36	33
Bare ground	35	32
Maianthemum	15	15
Bank	6	6
Fern	5	5
Stump	5	5
Dead roots	3	3
Grass	2	2
Tree base	1	1
Shrubs	1	1
Total	109	

Table MC350-3. Occupancy of storm-petrel burrows on Sinnett Islets on 19 June 1988.

						Fork-tailed			Leach's		
Location Transect	Plot	Empty	Cold egg	Warm egg	Unid. adult	Adult	Adult +egg	Chick	Adult	Adult + egg	Total
1	1	3				1	2			1	7
1	2	1	1							1	3
1	3	1			1		1				3
1	4					1	1	1	1		4
2	1	1									1
3	2			1		1	1	1			4
3	3	1					1		1		3
3	4	1	1					1			3
3	5	1				1[a]	3	1			6
4	1	2					1	2			5
4	2	1				1			1[a]		3
4	3	1				1[a]	1				3
4	4							1			1
4	5		1								1
4	6	1									1
5	1					1					1
5	2									1	1
5	4	1	1								2
Total		15	4	1	1	7	11	7	3	3	52

[a] burrow held two adults.

Black Oystercatcher: We found 7 nests (Table MC350-4; Fig. MC350-1). One nest was built of moss, grass and dried forbs, and looked like a small Glaucous-winged Gull nest. Two others were made of limpet shells laid in worn dirt bowls in the grass. Others were limpet and mussel shells on rock.

Table MC350-4. Black Oystercatcher nests on Sinnett Islets in 1988.

Islet	Empty	1E	2E	Total
1	1			1
3	1			1
7		1	1	2
8		1		1
9			2	2
Total:	2	2	3	7

Glaucous-winged Gull: We counted 93 gulls nests (Table MC350-5; Fig. MC350-1). Nests were made of grass, with lichen, fern and forbs in some nests on islet 4, and some seaweeds in nests on islet 1. We found 4 depredated eggs.

Table MC350-5. Glaucous-winged Gull nests on Sinnett Islets in 1988.

Islet	Start	Empty	1E	2E	3E	Total
1	4	15	7	8	9	43
2		1	1		10	12
3		2	1		2	5
4		2	1	1	14	18
5		1				1
6					1	1
7					1	1
8					1	1
9	2	1	2		4	9
10				1		1
11				1		1
Total:	6	22	12	11	42	93

Pigeon Guillemot: We found two nests with single eggs, one on islet 1 under a rock, and 1 on islet 3 in a burrow, and one nest with 2 eggs under a boulder on islet 8. There were a maximum of 43 birds around the islets: 2 on islet 1, 23 around islets 2, 3 and 4, and 18 at islet 6.

Cassin's Auklet: Cassin's Auklets were nesting in grassy areas on the perimeters of vegetated islets, generally within 10 m of shore rock (Table MC350-6; Fig. MC350-1). We determined the contents of two burrows: one was empty and one held an incubating adult. Most burrows were worn with droppings at their entrances.

1988 Population estimate:

Number of sample plots:	9 (36 m^2 - 0.4% of colony)
Average density:	2778 ± 1584 burrows/ha
Colony area:	1.0 ha

Total burrows: 2834 ± 1616

1988 Occupancy rate: not determined

1988 Nesting population: Using median occupancy rate for British Columbia of 75% (Rodway *et al.* 1988):

2126 ± 1212 pairs

Table MC350-6. Number of Cassin's Auklet burrows in 2x2 m plots along transects on Sinnett Islets in 1988. Plots considered outside the colony are indicated by a dash.

Plot	Transect 1	2	3	4	5
1	0	0	6	0	1
2	-	-	-	-	-
3	-		-	-	-
4	0		-	-	1
5			1	-	
6				1	

Tufted Puffin: We found one large burrow, suspected to be a puffin burrow, on the edge of steep grass on the southwest corner of islet 2 (Fig. MC340-1). We saw one bird in the water at the south end of the largest island and one flying off the rock west of the Sinnett Islets.

Predation: During exploration and transecting of Sinnett Islets we found: 10 wings, 5 feather piles, 1 carcass and 1 wing pair of Leach's Storm-Petrel, 3 feather piles, 2 wings and 1 wing pair of Fork-tailed Storm-Petrel, 1 pair of wings and 1 single wing of Cassin's Auklet, and 1 feather pile and 1 wing pair of Glaucous-winged Gull.

Associated species:

Pelagic Cormorant - 4 birds in non-breeding plumage on the south islet.

Bald Eagle - 2 nests found close together:

1. 18 m high in a 30 m spruce, 15 m from shore with no activity.
2. 40 m high in a 40 m spruce, 53 m from shore. 2 adults landed in the nest.

Marbled Murrelet - 1 on the outer southwest rock.

Northwestern Crow - 1

River Otter - Runs and scats of fish.

Other birds and mammals sighted:

Harlequin Duck - 8 males and 30 unsexed birds off the northern vegetated islets.

Rufous Hummingbird
Western Flycatcher
Winter Wren
Orange-crowned Warbler
Fox Sparrow
Song Sparrow
Red Crossbill
Pine Siskin

Harbour Seal - 10 adults and 6 pups seen at one time.

MC-360 CONROY ISLAND 103 A/11

Including the islet off the southeast corner.

Location: West of Harvey Islands, south of Byers Islands.
52°31'30"N 129°24'30"W

Land status: Provincial Ecological Reserve.

Date of visit: 29 May (1430-1950 h: exploration and partial burrow count on main island), 12 June (1320-1700 h: gull count) and 13 June 1988 (1100 h: boat around southeast rock).

Colony access: Boat landing on beaches at northeast corner; drop-off from boat for southeast rock.

Observers: M. Lemon, M. Rodway, B. Carter, M. Force, D. Grinnell, M. Grinnell.

Census method: Partial count for storm-petrels and auklets; total count for gulls and oystercatchers.

Description: This low, 50 m high, undulating island has rocky shores and extensive tidal rock shelves off the southeast side. Its total area is 63.9 ha. Small lagoons and inner beaches have formed where the rock shelves leave the main body of the island. Dense salal, salmonberry and Devils Club under spruce cover many perimeter areas but open fringes of *Maianthemum*, moss and grass are frequent. Trees and shrubs along exposed western edges are windswept. Bare litter and moss occur inland. *Salicornia pacifica* and *Plantago maritima* are common around the lagoons.

The southeast rock is grassy (mostly *Elymus*) with *Angelica*, *Montia*, *Maianthemum* and some salmonberry in the interior. A small cluster of stunted spruce on top are all dead but one.

Nesting species:

Leach's Storm-Petrel: Leach's Storm-Petrels were found nesting in grassy areas on the southeast rock (Fig. MC360-1). Two burrows examined contained single adults. We estimated 75 breeding pairs.

Black Oystercatcher: Seven nests were located (Table MC360-1; Fig. MC360-1). One nest on the northeast rocks was built with *Cochleria* stems and looked like a Glaucous-winged Gull nest except it was lined with shells. Other nests were made of shells or rock chips plus some coralline algae.

Table MC360-1. Black Oystercatcher nests on Conroy Island in 1988.

Location	Date	Empty	1E	2E	3E	Total
NE rocks	12 Jun	1		1		2
West side	29 May				2	2
S point	29 May	1				1
SE rock	12 Jun	2				2
Total:		4		1	2	7

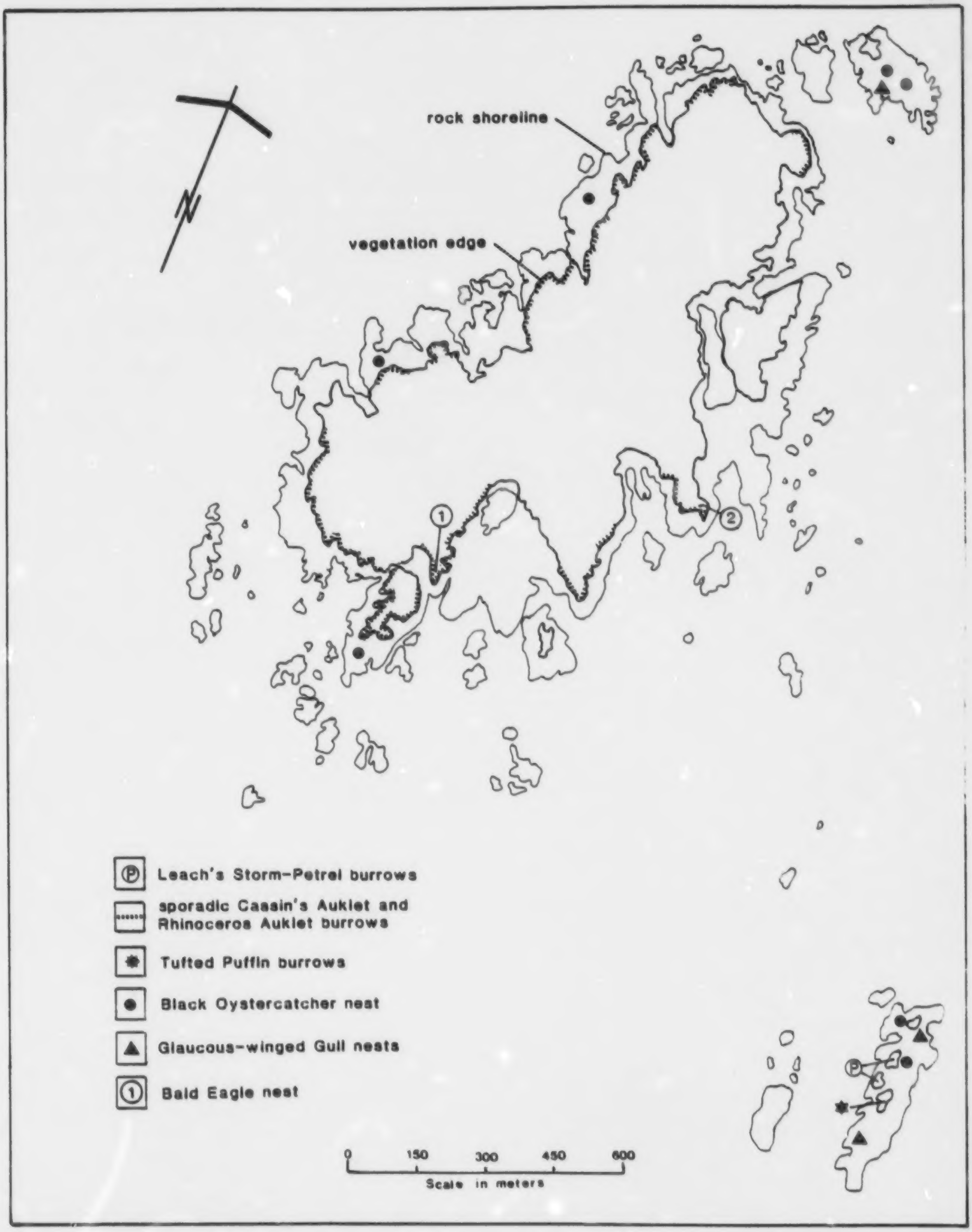
N
rock shoreline
vegetation edge
①
②
Ⓟ
Ⓟ Leach's Storm-Petrel burrows
sporadic Cassin's Auklet and Rhinoceros Auklet burrows
✱ Tufted Puffin burrows
● Black Oystercatcher nest
▲ Glaucous-winged Gull nests
① Bald Eagle nest
0
150
300
450
600
Scale in meters

Figure MC360-1. Seabird colony areas on Conroy Island in 1988.

Glaucous-winged Gull: We counted 208 gull nests on the northeast and southeast rocks (Table MC360-2; Fig. MC360-1). Nests were built of grass with some Cochleria in nests on the northeast rocks. We found 16 depredated eggshells, and many nests were empty, but we suspected that eggs had not yet been laid in most nests.

Table MC360-2. Glaucous-winged Gull nests on Conroy Island in 1988.

Location	Start	Empty	1E	2E	3E	4E	Total
NE rocks	3	1	1	2	7		14
SE rock	32	65	36	20	38	3	194
Total:	35	66	37	22	45	3	208

Pigeon Guillemot: There were a maximum of 148 guillemots around Conroy Island: 10 on the northeast rocks and 13 along the east side of the main island at 1400 h on 12 June, plus 125 around the southeast rock at 1100 h on 13 June. We found 3 empty nests and 2 nests with 1 egg under rocks on the southeast islet.

Cassin's Auklet: Cassin's Auklets were nesting sporadically around the perimeter of the main island within 5 m of the edge of the vegetation (Fig. MC360-1). Burrows were most abundant on rocky knolls under roots and stumps in moss, grass and Maianthemum vegetation. Few were located under short salmonberry and on the edge of higher shrubbery. Breeding was not confirmed but burrows were worn with droppings and feathers at their entrances. We counted 148 burrows and estimated a breeding population of 450 pairs, 250 along the south and east sides and 200 along the west and north sides. One bird was sighted on 12 June off the east coast.

Rhinoceros Auklet: Rhinoceros Auklets burrows were found in the same locations and habitats as Cassin's Auklet burrows, though Rhinoceros Auklets were more abundant on the west and north sides of the island than on the south and east sides (Fig. MC360-1). We estimated a breeding population of 500 pairs, 450 on the west and north sides and 50 on the south and east sides. Breeding was not confirmed but burrows were worn with droppings and feathers at their entrances.

There were 200 birds on the water north of Conroy Island on 29 May at 1956 h, 120 flying west off the northeast rocks on 12 June between 1320 h and 1450 h, and 600 seen east of Conroy Island on 13 June at 0930 h.

Tufted Puffin: Tufted Puffins were nesting on the southeast islet (Fig. MC360-1). We found 10 burrows in grassy areas: 4 contained warm eggs, an adult was felt in 1, 2 were empty, and the contents of 3 were undetermined. There were 6 birds flying around the southeast islet on 12 and 13 June.

Horned Puffin: One pair of Horned Puffins were flying and sitting on the water around the southeast islet on 12 and 13 June. We suspected they were nesting in the vicinity of the Tufted Puffin burrows.

Predation: One Black-legged Kittiwake wing was the only evidence of predation found on Conroy Island.

Associated species:

Brandt's Cormorant - 9 first year birds on 12 June off the northeast rocks, and 90 in non-breeding plumage and 9 immatures roosting on the southwest tidal rocks on 12 June.

Pelagic Cormorant - 1 in non-breeding plumage on 12 June on the east coast, and 3 immatures roosting on southwest tidal rock on 12 June.

Bald Eagle - 2 nests were found, only 1 with activity:
1. 25 m in a 28 m spruce snag, 10 m from shore. No activity on 29 May.
2. 12 m high in 15 m spruce, 10 m from shore. One adult in nest with another adult nearby on 29 May.

Ancient Murrelet - On 12 June we saw: 3 adults in breeding plumage off the east side, 2 adults with 2 chicks and 2 adults without chicks off the south end, and 4 chicks together, 2 of them diving, with 2 adults close by.

Northwestern Crow - 6+ on 12 June.

Common Raven - 1 on 29 May.

River Otter - Runs.

Other birds and mammals sighted:

Pacific Loon - 3 on 29 May north of Conroy Island and 2 off the east coast on 12 June.

Sooty Shearwater - 1 flying on 12 June.

Short-tailed Shearwater - 3 with a Rhinoceros Auklet flock on 13 June east of Conroy.

Harlequin Duck - 2 females on 12 June.

Black-legged Kittiwake - 1 adult flying to a feeding ball on 29 May north of Conroy Island.

Rufous Hummingbird
Winter Wren
Orange-crowned Warbler
Savannah Sparrow
Song Sparrow
Pine Siskin

Harbour Seal - 79 were hauled out on the southeast rocks and 12 with 1 pup were seen off the northeast rocks on 12 June.

Whale sp. - 1 suspected Minke on 29 May north of Conroy Island.

MC-370 HARVEY ISLANDS 103 A/11

Location: West of Arriaga Islands off the southwest coast of Aristazabal Island. 52°31'N 129°19'W

Land status: Crown land.

Date of visit: 13 June 1988 (1200-2120 h).

Colony access: Drop-off from boat.

Observers: M. Lemon, M. Rodway, B. Carter, M. Force, D. Grinnell, M. Grinnell.

Census method: Partial count for storm-petrels and auklets; total count for gulls and oystercatchers.

Description: Tidal rock and mud flats join this cluster of low islands. Rocky knobs and ridges occur along shorelines, but most of the area is flat with little slope. The island rises to 45 m elevation and has an area of 39.0 ha. Spruce dominates the forest on small islands, mixing with hemlock and redcedar on larger islands. Dead snags are scattered thoughout interiors, and some spruce on the northeast corner of the main island appear diseased. Crabapple is common on perimeters. Thick shrubs, primarily salal or salmonberry, though robust twinberry and other species are abundant along the east side of the largest island, form most of the understory. Fringes of grass and moss occur around the main island, and herbaceous areas are more extensive on some of the smaller islands.

Nesting species:

Storm-Petrel: Isolated pockets of storm-petrel burrows were discovered on islands 6 and 9 (Fig. MC370-1). An estimated 200 burrows were scattered around the perimeter of island 6 within 5 m of the edge of vegetation in patches of Maianthemum and grass. There were nine burrows on island 9. We estimated a breeding population of 200 pairs, 100 each of Fork-tailed and Leach's storm-petrels. Breeding was not confirmed. We found feathers of Fork-tailed Storm-Petrel (see predation).

Black Oystercatcher: Twelve oystercatcher nests were located (Table MC370-1; Fig. MC370-1). In three nests, eggs were laid on bare rock without nesting materials, three nests were grassy bowls with few shells, and the rest were made of rock chips and shell fragments. Twenty-four birds were gathered in one flock on the northeast corner of the main island.

Table MC370-1. Black Oystercatcher nests on Harvey Islands in 1988.

Island	Empty	1E	2E	3E	Total
2		2			2
3	2	1			3
4			1		1
5		1		1	2
6	1				1
8	1				1
9		2			2
Total:	4	6	1	1	12

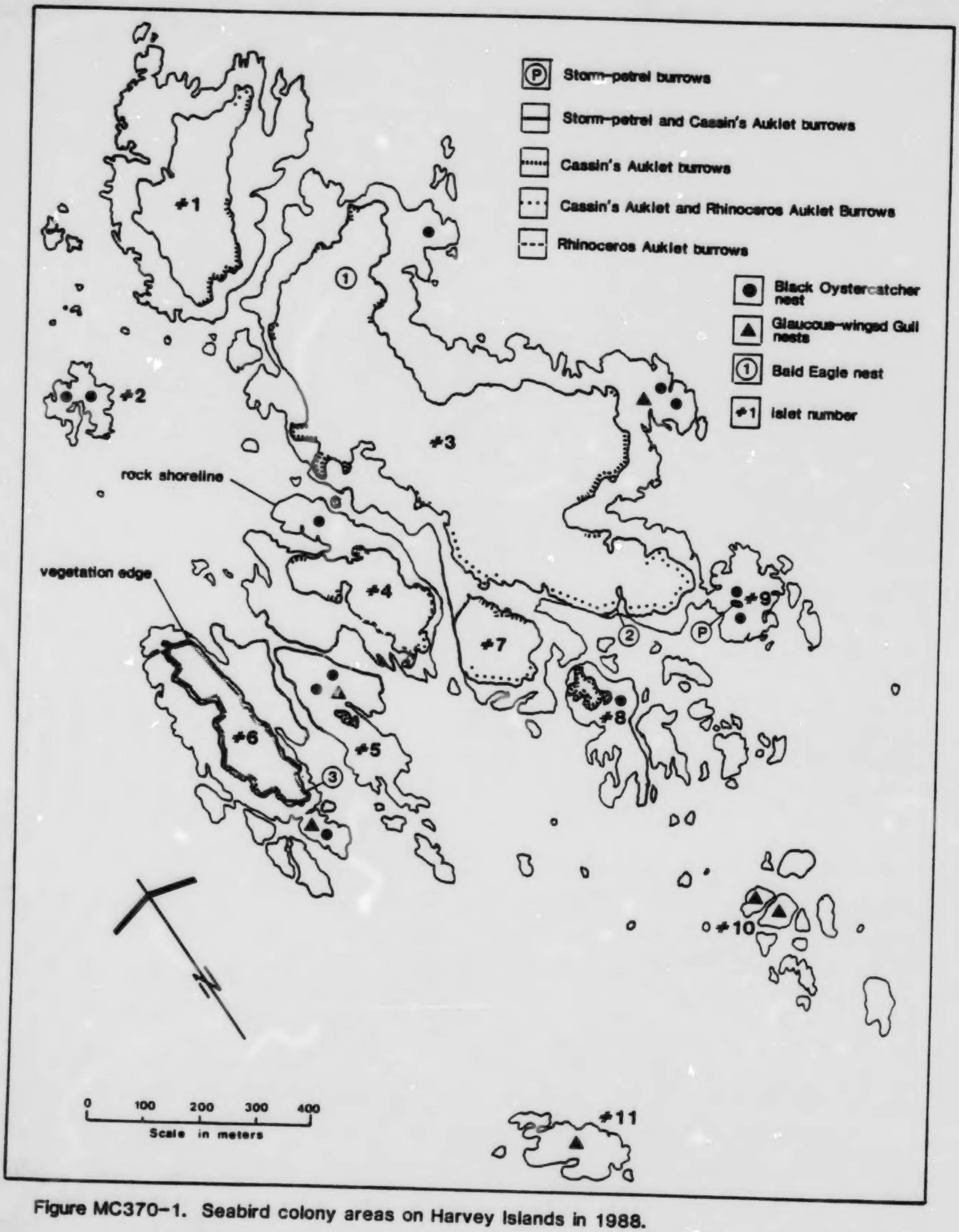

Figure MC370-1. Seabird colony areas on Harvey Islands in 1988.

Glaucous-winged Gull: We counted 93 nests (Table MC370-2; Fig. MC370-1). Most nests were built of grass, a few had some forbs, and lower, perimeter nests were made partially or entirely of seaweeds. Three nests appeared to have been destroyed.

Table MC370-2. Glaucous-winged Gull nests on Harvey Islands in 1988.

Island	Start	Empty	1E	2E	3E	Total
3	1					1
5	1					1
6	1					1
10	3	4	10	10	23	50
11	7	10	9	5	9	40
Total:	13	14	19	15	32	93

Pigeon Guillemot: A maximum of 24 birds were counted around the islands: 11 on north side and 8 on the outer west side of the group, and 5 on the west side of island 7, where 2 were seen flying out of burrows. We also found 1 dead bird in the water, with blood on its head, that we suspected had recently been killed by a falcon or eagle.

Cassin's Auklet: Cassin's Auklets were nesting sporadically on the perimeters of most islands within 5 m, and often within 1 m of the edge of the vegetation (Table MC370-3; Fig. MC370-1). Burrows occurred around rocky knolls and ridges in Maianthemum, moss and grass vegetation, and under roots on the edge of thick salal and other shrubbery. They were absent from low, level areas. Most burrows were worn with droppings at their entrances. One downy chick, with primaries just beginning to emerge from sheaths, was pulled from a 1.3 m long burrow on island 8. The hatched eggshell and membrane were in the tunnel. We estimated a total breeding population of 940 pairs.

Table MC370-3. Numbers of Cassin's Auklet and Rhinoceros Auklet burrows counted and estimated on Harvey Islands in 1988.

Island	Cassin's Auklet Burrows counted	Cassin's Auklet Total estimated	Rhinoceros Auklet Burrows counted	Rhinoceros Auklet Total estimated
1	25	25	8	8
3	181	226	51	101
4	22	22	41	41
5	26	26	0	0
6	100	521	0	0
7	19	24	44	59
8	96	96	0	0
Total:	469	940	144	209

Rhinoceros Auklet: Rhinoceros Auklets were nesting in similar habitat as Cassin's Auklets but their distribution was less extensive. Rhinoceros Auklet burrows were most abundant around the south ends of islands 3, 4 and 7 (Table MC370-3; Fig. MC370-1). We estimated a breeding population of 210 pairs. Breeding was not confirmed.

Predation: During exploration we found: 3 Fork-tailed Storm-Petrel, 2 Cassin's Auklet, 1 Rhinoceros Auklet, and 1 Ancient Murrelet feather pile.

Associated species:

Brandt's Cormorant - 3 in alternate plumage but lacking head plumes on west south rock.

Bald Eagle - 3 nests were found, all with adults nearby:
1. 25 m high in 35 m spruce on the northwest corner of the large east bay, 30 m from the shore. 2 adults were calling.
2. 20 m high in a 22 m spruce snag, 5 m from shore. 1 adult calling.
3. 20 m high in 25 m spruce, 15 m from shore. 1 adult nearby.

Peregrine Falcon - 1 nest found 30 m high in a 35 m spruce, 30 m from shore, at the head of the large southeast bay. 2 adults were at the nest with 1 large young visible.

Marbled Murrelet - 22 along the east side of the outer southwest islands.

Ancient Murrelet - 1 chick about 2 weeks old swimming near the shore of the outer west side of the outer south west islands; no adults were seen. 15 including a flock of 8 in flight west of south rock.

Northwestern Crow - Maximum of 4 seen at one time.

River Otter - Runs, scats, and 1 den; 3 seen on the north side.

Other birds and mammals sighted:

Sooty Shearwater - 1 south of west south rock.

Harlequin Duck - 13 males east of south rocks and 2 males off north west rocks.

Ring-billed Gull - 1 second year bird east of south rocks.

California Gull - 94 east of south rocks, mostly second summer with some third summer and 3 adults; 23 on a rock south of the main west south rock.

Herring Gull - 9 east of south rocks, including 3 or 4 first summer, 1 adult, and the rest second year birds.

Black-legged Kittiwake - 1 adult flying to a feeding ball on 29 May north of Conroy Island.

Rufous Hummingbird
Belted Kingfisher
Western Flycatcher
Winter Wren
Swainson's Thrush
Hermit Thrush
Orange-crowned Warbler
Fox Sparrow
Song Sparrow
Dark-eyed Junco
Red Crossbill - Flock of 8.
Pine Siskin - Flock.

Harbour Seal - 54 were hauled out on the offshore rocks at the south end.

MC-380 ROGERSON ROCK

103 A/6

Location: West of Weeteeam Bay at the south end of Aristazabal Island. 52°29'20"N 129°05'38"W

Land status: Crown land.

Date of visit: 24 June 1988 (1400-1430 h).

Colony access: Drop-off from boat.

Observers: B. Carter, M. Force.

Census method: Total count.

Description: Rogerson is a 15 m high rock with few tufts of vegetation in higher cracks.

Nesting species:

Black Oystercatcher: One nest with two eggs was found. It was made of mussel shell fragments plus a few limpets and pieces of red turban shell.

Glaucous-winged Gull: Most of the 52 nests counted were empty (Table MC380-1). Egg predation was considerable; we found 26 depredated eggs, 7 lying beside empty nests.

Table MC380-1. Glaucous-winged Gull nests on Rogerson Rock in 1988.

Start	Empty	1E	2E	3E	Total
13	23	12	1	3	52

Pigeon Guillemot: Six birds were present. Observers found 2 nests with 2 eggs each.

Associated species:

Cormorant sp. - 35 roosting: we estimated 5 Pelagic and 30 Brandt's cormorants.

Glaucous-winged-Western Gull hybrid - 2 adults.

Rhinoceros Auklet - 1 at 1430 h.

Other birds and mammals sighted:

Pacific Loon - 1 flying.
White-winged Scoter - 4
California Gull - 4 second and third year birds.

MC-390 STEELE ROCK 103 A/6

Location: South of Conroy and Harvey Islands, west of the south tip of Aristazabal Island. 52°27'52"N 129°22'07"W

Land status: Crown land.

Date of visit: 12 June 1988 (1750-1820).

Colony access: Drop-off from boat.

Observers: M. Rodway.

Census method: Total count.

Description: Vertical basaltic blocks make Steele Rock a giant stairway ascending from the south end, and bounded on the other three sides by precipitous faces. It is 16 m high.

Nesting species:

Pelagic Cormorant: There was no evidence of nesting by cormorants. Fourteen birds in nonbreeding plumage were roosting.

Black Oystercatcher: One pair on the top of the rock were very excited, but we could find no evidence of nesting.

Glaucous-winged Gull: Eleven adults were standing on the top of the rock, but there was no sign of nests.

Pigeon Guillemot: Three birds scared off the north end as we approached.

Predation: The top of the rock was littered with old and recent depredated remains: 12 shearwaters sp., 2 of which were definite Sooty Shearwaters, 1 Northern Fulmar skull and carcass, 1 Pelagic Cormorant skull, 1 pair of Cassin's Auklet wings, and many unidentified bones. The shearwater carcasses had the wings attached and the skin curled back. Two large Bald Eagle pellets accompanied the remains.

Associated species:

Brandt's Cormorant - 116 first year birds roosting; one bird was older with black plumage.

Ancient Murrelet - 4 adults on water.

Rhinoceros Auklet - 1 flying by.

Tufted Puffin - 1 flying by.

Other birds and mammals sighted:

Northern Sea Lion - 29 with 1 large bull hauled out on the northeast corner.

MC-400 "PRICE" ROCKS 103 A/7

Location: Off the south end of Price Island, north of McInnes Island. 52°18'08"N 128°44'40"W (west north rock), 52°18'00"N 128°43'32"W (east north rock), and 52°16'24"N 128°43'18"W (south rock).

Land status: Crown land.

Date of visit: 24 June 1988 (1640-1800 h).

Colony access: Drop-off from boat.

Observers: M. Lemon, M. Rodway, B. Carter, M. Force.

Census method: Total count.

Description: The northern two granitic rocks have corrugated surfaces, but the southern rock is dome-shaped with steep sides, rising to 12 m elevation.

Nesting species:

Black Oystercatcher: There was 1 nest with 3 eggs on the outer west, northern rock. Eggs were laid on bare rock amongst a few pieces of barnacle shell.

Glaucous-winged Gull: We counted 82 nests on the three rocks (Table MC400-1). Most nests were empty. Thirteen depredated eggs were found, 4 of them in empty nests.

Table MC400-1. Glaucous-winged Gull nests on "Price" Rocks in 1988.

Rock	Start	Empty	1E	2E	3E	Total
West northern		1				1
East northern	1	3	5	6	6	21
South	18	36	5		1	60
Total:	19	40	10	6	7	82

Associated species:

Pelagic Cormorant - 9 in non-breeding plumage off northern rocks, and 5 in non-breeding plumage off southern rocks.

Brandt's Cormorant - 4 in non-breeding plumage off northern rocks, and 39 in non-breeding plumage off southern rocks.

Rhinoceros Auklet - 6 offshore.

Other birds and mammals sighted:

Pacific Loon - 2

Harlequin Duck - 14 male, 1 female plumage, and 1 unsexed.

White-winged Scoter - 1

Mew Gull - 1 adult.

Northern Sea Lion - 30 on rocks south of McInnes Island. 1 large bull.

MC-410 "LIMIT" ROCKS

103 A/1

Location: Southwest of Limit Island, south of Athlone Island. 52°06'45"N 128°28'50"W

Land status: Crown land.

Date of visit: 28 June 1988 (1135-1155 h).

Colony access: Drop-off from boat.

Observers: M. Lemon, M. Rodway, B. Carter, M. Force.

Census method: Total count.

Description: These irregular, 6 m high, granitic rocks have tufts of vegetation in higher clefts.

Nesting species:

Black Oystercatcher: One pair was present and we found one empty scrape of barnacle and clam shell fragments.

Glaucous-winged Gull: One pair of gulls were nesting. We found a depredated egg beside an empty nest. The nest was built of grass with bits of Plantago.

Pigeon Guillemot: There were 14 birds on the rocks. We found 3 nests: 1 with an adult under a rock, 1 with 2 eggs under a rock, and 1 with 1 egg in a crevice.

Associated species:

Northwestern Crow - 2 flew to the rock when we arrived.

MC-420 FINGAL ISLAND 103 A/1

Location: Southwest of Thompson Bay, northwest of McMullin Group.
52°04'45"N 128°26'45"W

Land status: Crown land.

Date of visit: 28 June 1988 (0955-1120 h).

Colony access: Boat landings on beach at east end.

Observers: M. Lemon, M. Rodway, B. Carter, M. Force.

Census method: Total count.

Description: Fingal Island is formed of fantastic columnar basalt. Northeast faces are precipitous, rising to 40 m elevation, while the southwest side is gently stepped. There is a beach joining the northeast rocks to the main island. The top of the island has a spruce forest, with an lush understory of grasses and forbs plus some patches of salmonberry in the interior. The southeast knob has a small stand of spruce surrounded by grass and forbs. Lower rocks are bare.

Nesting species:

Fork-tailed Storm-Petrel: We found no evidence of nesting by storm-petrels.

Black Oystercatcher: Three pairs of oystercatchers were nesting. One nest with 1 egg was located on the west end of the main island. The egg was laid on the bare rock amongst bits of rock and trampled Potentilla. Two empty scrapes, defended by very excited adults, were located on the north rock and the southeast rock. We found two broken eggs near the nest on the north rock. That nest was a dirt bowl worn into a patch of Potentilla maritima. The nest on the southeast rock was just a bowl in the rock.

Glaucous-winged Gull: The main nesting area was on the southeast rock, where we counted 47 nests (Table MC420-1). A single nest was found on the north rock. Nests were made of grass plus a few twigs, forbs and moss. We found one depredated egg.

Table MC420-1. Glaucous-winged Gull nests on Fingal Island in 1988.

Location	Start	Empty	1E	2E	3E	Total
Southeast rock	1	11	8	13	14	47
North rock		1				1
Total:	1	12	8	13	14	48

Pigeon Guillemot: There were 25 birds on the southeast rocks at 0955 h. We found 2 nests with single eggs under rocks.

Predation: We found feather piles of 1 immature Glaucous-winged Gull and 1 juvenile Ancient Murrelet with feathers half emerged from sheaths.

Associated species:

Bald Eagle - There were 2 nests only 25 m apart near the southeast end of the island:
1. 30 m high in 33 m spruce 10 m from west shore. 2 adults present.
2. 25 m high in 30 m spruce 10 m from southeast end.

Northwestern Crow - 1

River Otter - Well worn, extensive runways, and many scats of fish.

Other birds and mammals sighted:

Hermit Thrush
Starling - 2
Song Sparrow
Fox Sparrow
Pine Siskin - 5

MC-430 GUANO ROCKS 103 A/1

Location: At the north end of Queen's Sound, west of the Tribal Group. 52°02'55"N 128°21'30"W

Land status: Crown land.

Date of visit: 28 June 1988 (1808-1820 h).

Colony access: Drop-off from boat.

Observers: M. Lemon, M. Rodway, B. Carter, M. Force.

Census method: Total count.

Description: This is an 8 m high, granitic rock.

Nesting species:

Black Oystercatcher: No oystercatchers were seen.

Glaucous-winged Gull: There were 11 nests, mostly empty (Table MC430-1). Nests were made of grass and seaweeds. Twenty-six adults were present.

Table MC430-1. Glaucous-winged Gull nests on Guano Rocks in 1988.

Start	Empty	1E	2E	3E	Total
3	3	4	1		11

Pigeon Guillemot: We found 2 nests under rocks: 1 with 2 eggs, and 1 with an adult. Three other adults were loafing.

Associated species:

Pelagic Cormorant - 8 in nonbreeding plumage.

MC-440 "FITZMELON" ROCK

103 A/1

Location: Off the mid-east side of Athabaskan Island.
52°02'16"N 128°17'18"W

Land status: Crown land.

Date of visit: 28 June 1988 (1735-1745 h).

Colony access: Drop-off from boat.

Observers: M. Lemon, M. Rodway, B. Carter, M. Force.

Census method: Total count.

Description: This is a 3 m high rock.

Nesting species:

Glaucous-winged Gull: There were 3 nests: 1 empty and 2 with 1 egg each. One depredated egg was found. Six adults were present.

Associated species:

Pelagic Cormorant - 3 in nonbreeding plumage.

Other birds and mammals sighted:

Harlequin Duck - 3 males.

MC-450 GOOSE ISLAND

103 P/16

Location: West side of Queen's Sound. 51°58'N 128°26'W

Land status: Crown land.

Date of visit: 24-29 June 1988 (base camp); exploration on 26 and 29 June.

Colony access: Boat landings on beaches around the island.

Observers: M. Lemon, M. Rodway, B. Carter, M. Force.

Census method: Exploration and total count.

Description: Goose is a low island with extensive rocky shores, sandy bays and tidal flats. It rises to a maximum elevation of 66 m. Most perimeter habitat is dense salal under spruce, hemlock and redcedar, though mossy ground occurs in interior areas. The small grassy islet off the mid-west coast of Goose Island is surrounded by beach and tidal rock.

Nesting species:

Black Oystercatcher: Two pairs were defending nests on the small, grassy islet off the west side (Fig. MC450-1). Before we landed on the islet, we observed 3 ravens mobbing one pair of oystercatchers at the south end. One raven then flew off with an egg. We were unable to locate the nest this egg came from, but the oystercatchers were very agitated by our presence. We found an empty scrape in sand at the north end of the islet, defended by a second pair of adults.

Pigeon Guillemot: There was one bird off the west side of the island on 27 June, and 3 off the east side on 29 June, but they were not in proximity to nesting habitat.

Associated species:

Pelagic Cormorant - 12 in nonbreeding plumage roosting on the west side of Goose Island, and 8 in nonbreeding plumage on the west side of Duck Island on 27 June.

Bald Eagle - 10 nests were found, 8 of them active:

1. 20 m high in a 25 m spruce, 10 m from shore. 12 adults perched above nest on 26 June.
2. 30 m high in a 35 m spruce, 5 m from shore. 2 adults nearby on 26 June.
3. 25 m high in a 28 m spruce (snag). 2 adults were perched above the nest on 26 June.
4. 25 m high in a 30 m spruce, 10 m from shore. 1 adult perched between nest #4 and nest #5 on 27 June.
5. 15 m high in a 30 m spruce, 10 m from shore.
6. 15 m high in a 25 m spruce, 10 m from shore. 2 adults perched above nest on 27 June.
7. 23 m high in a 25 m spruce, 5 m from shore. 1 adult perched in nest tree on 27 June.
8. 35 m high in a 45 m snag, 80 m from shore. 1 adult present between nest #8 and nest #9 on 27 June.
9. 20 m high in a 30 m forked spruce, 20 m from shore.

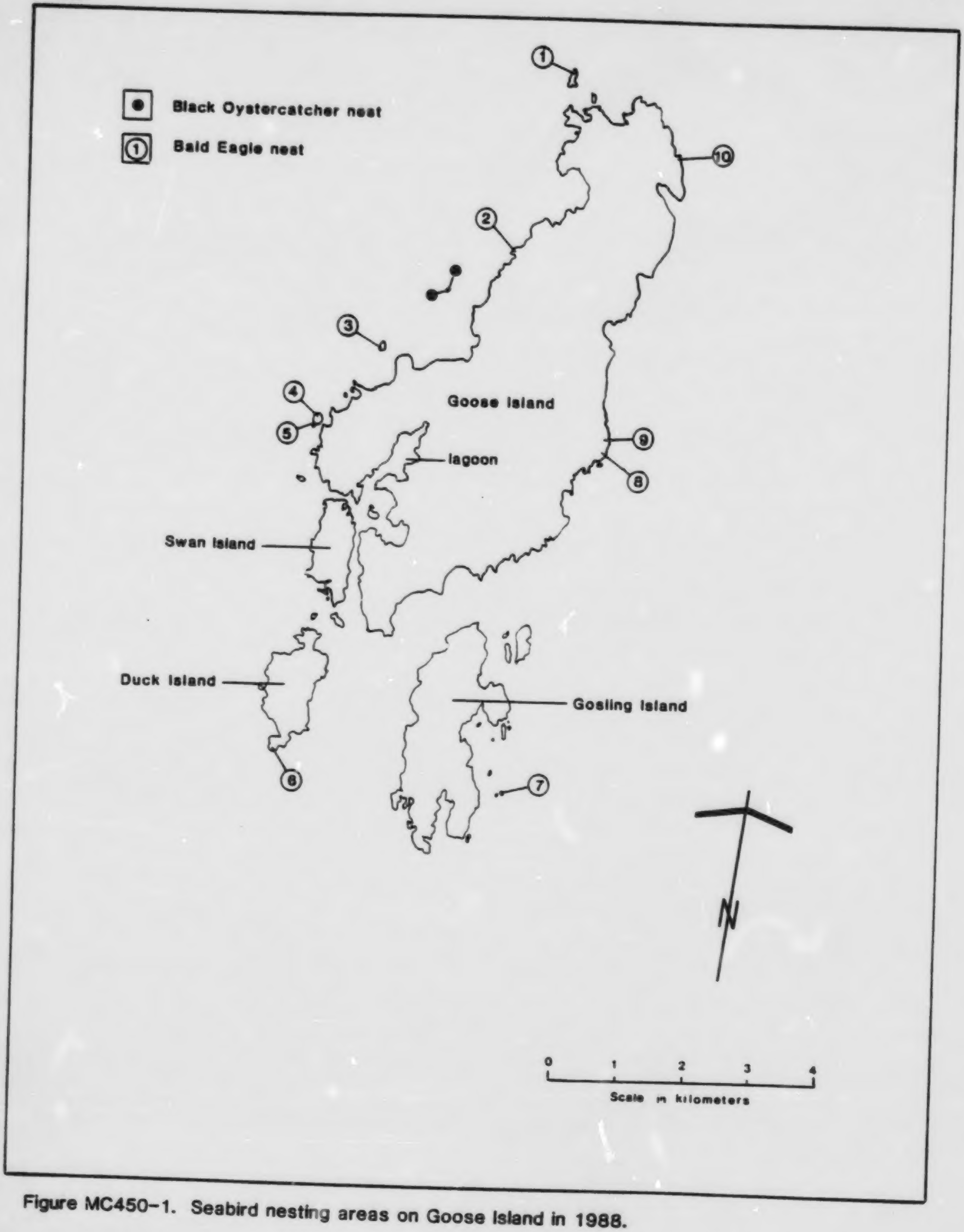

Figure MC450-1. Seabird nesting areas on Goose Island in 1988.

10. 30 m high in a 35 m spruce, 10 m from shore. 2 adults perched nearby.

Common Murre - 5 offshore east of Goose Island on 25 June, 1 in breeding plumage on the west side of Duck Island on 27 June, and 2 in breeding plumage east of the island on 29 June.

Marbled Murrelet - 14 north of Goose on 24 June; 1 in winter plumage off the northwest islet, 29 off the west side of Swan Island, and 40 off the west side of Duck Island on 27 June; 32 in summer plumage scattered along the east side of Goose Island in groups of 2 to 12 on 29 June.

Ancient Murrelet - 2 adults with 3 chicks on the water off the west side of Swan Island on 27 June. The chicks were about two-thirds adult size and still downy, but getting a facial pattern. 1 juvenile was seen at the northeast corner on 29 June, fully feathered but dirty around the face and breast with indistinct facial markings.

Cassin's Auklet - 1 juvenile on the water on 29 June at the northeast corner of the north bay.

Rhinoceros Auklet - 12 on 24 June north, 4 on 27 June off the west side of Swan Island, and 40 on 27 June on the west side of Duck Island.

Glaucous-winged Gull - 2 adults roosting on northwest rock on 26 June.

Northwestern Crow - Maximum of 10 seen on 26 June.

Common Raven - 2 adults and 2 young seen together on 26 June. 4 seen on 27 June on the small grassy islet off the west side.

Deer Mouse - Around camp.

Mink - Seen along shore; numerous tracks, trails and scats.

River Otter - Signs abundant. 1 family of 2 adults and 3 young seen on 26 June.

Sitka Deer - one doe and 1 young on 26 June. 2 doe on 26 June.

Other birds and mammals sighted:

Red-throated Loon - 1 flying inland with a fish and 1 seen in the large mid-west bay on 26 June; 1 in summer plumage on 29 June off the east side.

Pacific Loon - 3 flying off the west side of Swan Island on 27 June.

Common Loon - 1 in winter and 1 in summer plumage on 29 June off the east side.

Red-necked Grebe - 1 in summer plumage off the east side on 29 June.

Great Blue Heron - 1 immature on 29 June in the lagoon.

Harlequin Duck - 2 males on 25 and 29 June.

Surf Scoter - 5 males and 3 females on 26 June. 17 on 29 June on the east side of the island: about half were immature, 1 was a full male, and the rest were females.

White-winged Scoter - 42 on 26 June on the west side of the island.

Hooded Merganser - 1 female on 25 June.

Greater Yellowlegs - 2 on 29 June in the lagoon.

Western Sandpiper - 5 suspected, flying over the lagoon on 29 June.

Franklin's Gull - 1 adult roosting with a flock of California Gulls at the north end on 27 June.

Mew Gull - 27, mostly adults, on 25 June, and about 25 immatures and adults on the east side on 29 June. 2 adults dive bombing a Bald Eagle and a Common Raven over the interior of the island north of the lagoon on 29 June. Suspected to be nesting in the muskeg.

California Gull - 80, mostly immatures, roosting and feeding on the north beach on 25 June; 49, at least one adult but mostly immature, on 27 June.

Herring Gull - 2 adults on 29 June on the east side.

Caspian Tern - 3 suspected, seen from a distance off the west side of Duck Island on 27 June.

Rufous Hummingbird - Maximum of 3 seen at once.

Belted Kingfisher - 1 male and 1 female.

Northern Flicker

Western Flycatcher - Maximum of 12 seen at once on 29 June.

Chestnut-backed Chickadee - Family group with at least 2 young seen and a total of 4 groups heard on 26 June.

Red-breasted Nuthatch

Brown Creeper

Winter Wren - Frequently seen around the island; 1 fledged young seen on 26 June.

Golden-crowned Kinglet - 2 family groups seen, 1 with 4 young, 1 with at least 2 young seen on 26 June.

Swainson's Thrush

Hermit Thrush - A family with at least two fledged young seen on 26 June. 10 seen at one time on 29 June.

American Robin - 2 adults with one independent young seen on 26 June.

Varied Thrush

Orange-crowned Warbler - 1 family of 2 young present around camp.

Fox Sparrow - 1 family group of 2 adults and 2 young seen on 29 June.

One bird seen on the way to the lagoon on 29 June was suspected to be a hybrid between a Fox Sparrow and a Song Sparrow. Its song was a combination of the songs of the 2 species, both songs complete but joined together. It began its song with the Song-Sparrow portion and without a pause ran into a typical Fox Sparrow song. We heard it sing this complete double song over 10 times. The bird was slightly smaller than other Fox Sparrows, the breast spots were smaller, the breast was overall dirtier looking, the sides and flanks browner, and it was missing most of its retrices. Both Fox and Song sparrows were singing typical songs in the vicinity.

Song Sparrow - 1 family group with at least one young seen on 26 June. 2 family groups heard on 29 June and 2 young were seen of 2 different families.

Dark-eyed Junco

Red Crossbill - a flock of 20 observed on 29 June.

Pine Siskin

Wandering Shrew - 1 seen on 26 June.

Harbour Seal - 1 adult with 1 pup seen on 27 June. 4 seen on 27 June.

Gray Whale - 1 spouting offshore on the west side.

MC-460 GOSLING ROCKS

103 P/16

Location: South end of the Goose Group. 51°52'N 128°27'W

Land status: Crown land.

Date of visit: 27 June 1988 (1230-1830 h).

Colony access: Drop-off from boat.

Observers: M. Lemon, M. Rodway, B. Carter, M. Force.

Census method: Total count.

Description: Higher rocks in this cluster are grassy, with a small clump of windswept spruce snags on the highest, northern rock, which rises to 10 m elevation.

Nesting species:

Black Oystercatcher: We found 9 oystercatcher nests (Table MC460-1; Fig. MC460-1). Most nests were made of shell fragments on rock or beach areas. One was a small bowl of grass with some rock chips. Two nests on islet D were in cavities on old tree roots that had washed ashore. The cavities had been lined with shells. The empty nest on islet H contained eggshell fragments. There was a roosting flock of 20 birds on islet A.

Table MC460-1. Black Oystercatcher nests on Gosling Rocks in 1988.

Islet	Empty	1E	2E	3E	Total
B		1			1
C			1		1
D	1			1	2
F			1		1
G	2[a]				2
H	1				1
I		1			1
Total:	4	2	2	1	9

[a] Three empty nests were found but they were too close together to be used by more than two pairs.

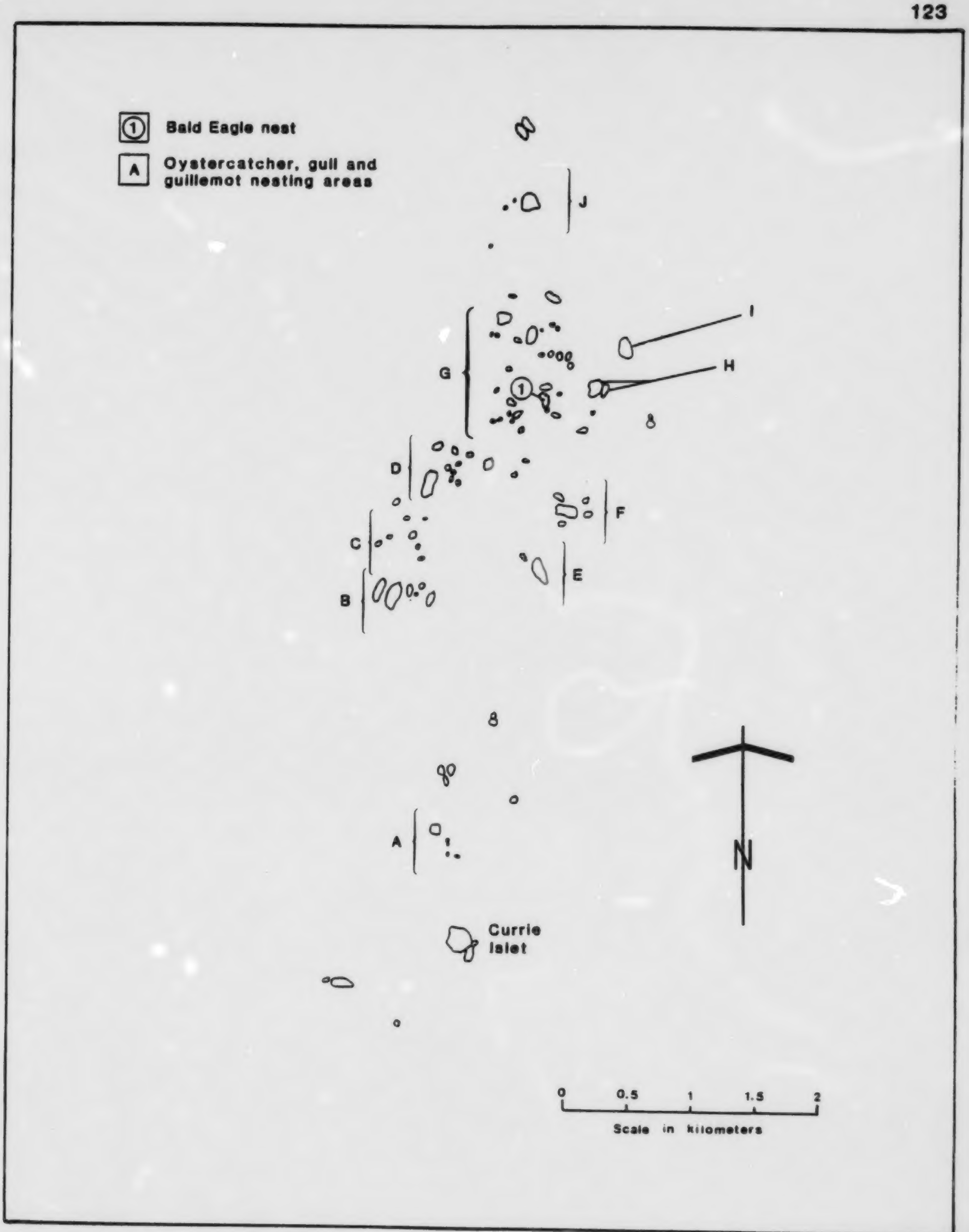

Figure MC460-1. Seabird nesting areas on Gosling Rocks in 1988.

Glaucous-winged Gull: A total of 83 gull nests were counted (Table MC460-2; Fig. MC460-1). Nests were made of grass. Most nests were empty or only partially constructed. We found 9 depredated eggs. There were a total of 500 immatures roosting on various rocks.

Table MC460-2. Glaucous-winged Gull nests on Gosling Rocks in 1988.

Islet	Start	Empty	1E	2E	3E	Total
A	9	12	9			30
B	5	13	3	3		24
C		1	1		4	6
D	2					2
E	1					1
F	1	3	1			5
G	1	1			2	4
H	1					1
I	3	6	1			10
Total:	23	36	15	3	6	83

Pigeon Guillemot: We located 7 nests and counted 31 birds around the rocks (Table MC460-3; Fig. MC460-1). All nests were found under rocks in crevices.

Table MC460-3. Pigeon Guillemot nests and birds on Gosling Rocks in 1988.

Islet	1E	2E	Adults
B	1		16
C	1	1	8
F	2	1	2
G		1	2
I			3
Total:	4	3	31

Predation: We found one carcass of one Sooty Shearwater and one Glaucous-Winged Gull feather pile.

Associated species:

Rhinoceros Auklet - 30 flying south of rock I at 1730 h.

Tufted Puffin - 1 flying north of Currie Islet.

Brandt's Cormorant - 2 non-breeding birds.

Pelagic Cormorant - 7 on rock E and 23 immatures and 1 in breeding plumage on rock I.

Bald Eagle - 1 nest found, 7 m high in an 8 m dead spruce. The female was present and vocal and 1 large young with a black head was visible in the nest.

Common Murre - 1 flying.

River Otter - trails and scats.

Other birds and mammals sighted:

Brant - 2

Harlequin Duck - 2 males flying at rock D and 62 birds at rock E, mostly males with 4 females seen.

Whimbrel - 7

Black Turnstone - 1

California Gull - About 100 immatures at rock F plus 60 immatures at rock I.

Herring Gull - 2 immatures and 2 adults at rock F.

Black-legged Kittiwake - 1 immature.

Marbled Murrelet - 14 off of rock J.

Song Sparrow - fledged young on rock D.

Sea Otter - 1 seen at 1645 in the kelp beds off rock H, and again at 1750 h swimming between Gosling Rocks and Gosling Island. It was swimming on its back, splashing with front paws on chest, and diving.

Harbour Seal - 21 at C, 32+ at D, 65 off the northeast islets and 3 adults with 2 pups at rock A.

Northern Sea Lion - 6 suspected bachelor males on shore and 12 females in the water.

MC-470 CURRIE ISLET

103 P/16

Location: At the south end of Gosling Rocks in the Goose Group.
51°51'05"N 128°27'20"W

Land status: Crown land.

Date of visit: 27 June 1988 (1240-1315 h).

Colony access: Drop-off from boat.

Observers: M. Lemon, M. Rodway, B. Carter, M. Force.

Census method: Total count.

Description: Currie Islet is a bare, 8 m high rock with a light beacon on the top.

Nesting species:

Black Oystercatcher: Three pairs were suspected nesting, but no nests were located.

Glaucous-winged Gull: There were 32 gull nests, mostly empty (Table MC470-1). Nests were built of grass and seaweeds, primarily Fucus, plus some Angelica stalks. We found 8 depredated eggs, some still in nests. There were about 130 adults on Currie Islet, and 60 immatures, mostly second year, roosting on the rock southwest of Currie Islet (see Figure MC460-1).

Table MC470-1. Glaucous-winged Gull nests on Currie Islet in 1988.

Start	Empty	1E	2E	3E	Total
9	15	7	1		32

Pigeon Guillemot: Four birds were courting.

Associated species:

Pelagic Cormorant - 6 nonbreeding plumage; 1 breeding plumage flying by.

Brandt's Cormorant - 7 nonbreeding plumage.

Bald Eagle - 1 immature.

Other birds and mammals sighted:

Harlequin Duck -3
California Gull - 3 immatures.

MC-490 "TRIQUET" ROCKS 103 P/16

Location: East of Triquet Island, west of Kidney Island.
51°47'58"N 128°13'22"W

Land status: Crown land.

Date of visit: 1 July 1988 (1500-1520 h).

Colony access: Drop-off from boat.

Observers: M. Lemon, M. Rodway, B. Carter, M. Force.

Census method: Total count.

Description: This is a 10 m high rock.

Nesting species:

Black Oystercatcher: Two pairs were present and 2 nests were found: 1 with 2 small, downy chicks, and 1 empty. Nests were made of limpet and mussel shell pieces.

Glaucous-winged Gull: One pair of gulls was sitting on the top of the rock. We suspected they were nesting but no nest was found. We had seen the pair sitting on the rock the previous day as well.

Pigeon Guillemot: Three birds were present, one of which flew out of a crevice under a rock. It was impossible to view the nest. We found one depredated egg.

Other birds and mammals sighted:

Black Turnstone - 2
Western Sandpiper - 5

MC-500 BLENHEIM ISLAND 103 P/16

Including rock to northeast.

Location: South of Triquet Island in the northwest corner of Kildidt Sound. 51°46'51"N 128°15'W

Land status: Crown land.

Date of visit: 29 June 1988 (2100-2220 h).

Colony access: Drop-off from boat.

Observers: M. Lemon, M. Rodway, B. Carter, M. Force.

Census method: Total count.

Description: Blenheim Island and the rock northeast of it are precipitous blocks of granite with many deep crevices. The main island is 72 m high and is forested with spruce on top. Grass, forbs and moss cover perimeter areas, and salmonberry and young spruce are more abundant in the interior. The northeast rock is bare.

Nesting species:

Pelagic Cormorant: Seventeen cormorant nests were located: 14 on the north side at the west end, 1 on the western bluff, and 2 on an interior cliff between east and west sections of the northeast rock. Adults were sitting on all nests. There were 166 cormorants roosting on the northwest corner of the main island, 19 of which were in breeding plumage.

Black Oystercatcher: There were 3 birds on the northeast rock, but no nest was located. We suspected 1 pair nesting.

Glaucous-winged Gull: Gulls were found nesting on the east end of the main island and on the northeast rock (Table MC500-1). We counted 68 nests, mostly empty. Nests were built of grass. We found 8 depredated eggs.

Table MC500-1. Glaucous-winged Gull nests on Blenheim Island in 1988.

Location	Start	Empty	1E	2E	3E	Total
Main island:						
East end bluffs					3	3
Rock at east end					2	2
Northeast rock:	12	25	16	8	2	63
Total:	12	25	16	8	7	68

Pigeon Guillemot: Fourteen birds were on the northeast rock and one was scared out of a crevice on the east end of the main island. The nest in the crevice on the main island contained 2 eggs; 2 nests found in crevices on the northeast rock contained 1 and 2 eggs.

Predation: We found 1 adult Glaucous-winged Gull feather pile and 1 adult Ancient Murrelet feather pile. There were many dead starfish on the top of the northeast rock.

Associated species:

Peregrine Falcon - A pair of adults with 2 fledged young were very upset by our presence on the south side of the island. The eyrie was located on steep rock on the south side.

River Otter - Worn trails and scats of fish.

Other birds and mammals sighted:

Harlequin Duck - 3 males.
Hermit Thrush

MC-510 AIRACOBRA ROCK

103 P/16

Location: Kildidt Sound, west of Stirling Island.
51°45'35"N 128°13'06"W

Land status: Crown land.

Date of visit: 1 July 1988 (1550-1610 h).

Colony access: Drop-off from boat.

Observers: M. Lemon, M. Rodway, B. Carter, M. Force.

Census method: Total count.

Description: Airacobra is a 14 m high, bare rock.

Nesting species:

Glaucous-winged Gull: We found 6 gull nests: 1 start, 4 empty and 1 with 1 egg. Fifteen adults were present.

Associated species:

Tufted Puffin - 1 adult offshore.

Other birds and mammals sighted:

Harlequin Duck - 73
California Gull - 1 second year.

MC-520 NORTH POINTERS

103 P/9

Including all rocks in vicinity off southwest end of Stirling Island.

Location: South side of Kildidt Sound, southwest of Stirling Island. 51°43'40"N 128°08'44"W

Land status: Crown land.

Date of visit: 1 July 1988 (1645-1800 h).

Colony access: Drop-off from boat.

Observers: M. Lemon, M. Rodway, B. Carter, M. Force.

Census method: Total count.

Description: These are bare rocks, the highest of which rises to 12 m.

Nesting species:

Pelagic Cormorant: We saw no evidence of nesting by cormorants. There were 34 birds in nonbreeding plumage roosting on the outer, southwest, 25′ rock.

Black Oystercatcher: No oystercatchers were seen.

Glaucous-winged Gull: Gulls were nesting on the western 30′ and 25′ rocks and the southwestern 40′ rock. We counted a total of 119 nests (Table MC520-1). Nests were made of sticks, grass and moss. We found 7 depredated eggs.

Table MC520-1. Glaucous-winged Gull nests on North Pointers in 1988.

Location	Start	Empty	1E	2E	3E	Total
30′ rock	5	6	5	7	3	26
25′ rock	1	2	3	10	8	24
40′ rock	11	30	6	14	8	69
Total:	17	38	14	31	19	119

Pigeon Guillemot: There were 2 guillemots on the western, 30′ rock, and 6 on the southwestern, 40′ rock.

Associated species:

Bald Eagle - 2 adult on outer rock.
Common Murre - 1 offshore.
Rhinoceros Auklet - 58 offshore.

Other birds and mammals sighted:

Harlequin Duck - 34
Surfbird - 16 in alternate plumage.
Red Knot - 1 in alternate plumage.
Western Sandpiper - 30

MC-530 UPWARD ROCK

103 P/8

Location: Off the southwest coast of Calvert Island.
51°27′N 128°00′50″W

Land status: Crown land.

Date of visit: 2 July 1988 (1505-1525 h).

Colony access: Drop-off from boat.

Observers: M. Lemon, M. Rodway, B. Carter, M. Force.

Census method: Total count.

Description: Upward is an 11 m high rock with patches of grass and *Angelica*.

Nesting species:

Black Oystercatcher: Four birds were present and suspected nesting but no nests were found.

Glaucous-winged Gull: There were 29 gull nests, most with full clutches (Table MC530-1). Nests were made of grass, seaweeds and some twigs. We found 1 depredated egg.

Table MC530-1. Glaucous-winged Gull nests on Upward Rock in 1988.

Start	Empty	1E	2E	3E	Total
0	3	2	7	17	29

Pigeon Guillemot: There were 17 birds on the rocks.

Associated species:

Pelagic Cormorants - 10 roosting.
Glaucous-winged-Western Gull hybrid - 1
Western Gull - 1 adult

Other birds and mammals sighted:

Black Turnstone - 1
Surfbird - 3
Least Sandpiper -1
California Gull - 9

MC-540 MAJOR BROWN ROCK 92 M/5

Location: Mouth of Rivers Inlet, northwest of Goose Bay.
51°25′27"N 127°41′55"W

Land status: Crown land.

Date of visit: 2 July 1988 (1745-1927 h).

Colony access: Drop-off from boat.

Observers: M. Lemon, M. Rodway, B. Carter, M. Force.

Census method: Total count.

Description: Much of the area is extensive, low, bare rock, with a sandy, beach-like enclave in the interior. On the northwest side is a higher vegetated section of Elymus, Heracleum, Conioselium, Mimulus and other forbs, and a pocket of salmonberry and currant. There is a light beacon on the higher section, and a large abandoned marker buoy cemented to the rocks on the northwest corner (see mortality).

Nesting species:

Pelagic Cormorant: There was no evidence of nesting. Four birds in nonbreeding plumage were roosting.

Black Oystercatcher: We found 5 nests: 1 with 1 egg, 3 with 2 eggs and 1 with 3 eggs. Nests were made of barnacle, mussel, chiton and limpet shells. One nest also had a few grass stems.

Glaucous-winged Gull: We counted 319 nests (Table MC540-1). There was no sign of hatching. Most nests were made of grass and forbs, plus a few sticks. Nests built low on the rock, just above the black algae zone, were made partially of seaweeds. We found 20 depredated eggs.

Table MC540-1. Glaucous-winged Gull nests on Major Brown Rock in 1988.

Start	Empty	1E	2E	3E	4E	Total
11	80	53	80	93	2	319

Pigeon Guillemot: One bird was seen on the edge of the rock.

Predation and mortality: The metal marker buoy has a 50 cm hole in the top, through which a number of birds have entered and then been unable to get out. There were carcasses and skeletons of cormorants, gulls and guillemots lining the bottom of the chamber. We plugged the hole with pieces of discarded timbers, which will temporarily obstruct access.

Associated species:

Glaucous-winged-Western Gull hybrid - 1 adult.
Western Gull - 1 adult.
Rhinoceros Auklet - 8 flying by.

Other birds and mammals sighted:

Harlequin Duck - 13 molting males.
Spotted Sandpiper - 5
Black Turnstone - 10
Surfbird - 52 in alternate plumage.
Western Sandpiper - 120 in alternate plumage.
Least Sandpiper - 6 in alternate plumage.
Long-billed Dowitcher - 2
Herring Gull - 1 third year.

Starling - 1
Harbour Seal - 2

MC-550 DUGOUT ROCKS 92 M/5

Location: Northwest of Kelp Head, entrance to Rivers Inlet.
51°22'03"N 127°48'22"W

Land status: Crown land.

Date of visit: 2 July 1988 (2030-2125 h).

Colony access: Drop-off from boat.

Observers: M. Lemon, M. Rodway, B. Carter, M. Force.

Census method: Total count.

Description: Dugout Rock is a 15 m high, irregular block of granite, steep on the south side, and is mostly bare with pockets of grass and forbs in higher cracks and seams. There is a navigation light, with accompanying debris scattered over the top of the rock.

Nesting species:

Pelagic Cormorant: We found 18 empty cormorant nests: 6 on cliffs on the south side near the east end, 10 on cliffs on the northwest corner, and 2 on a small, 2 m high, interior rock face on the north side. Nests were collections of grass and forbs with very little guano cementing them together. There were 34 adults in breeding plumage present plus 35 in nonbreeding plumage.

Black Oystercatcher: Three empty nests of barnacle shells were defended by 3 pairs of adults.

Glaucous-winged Gull: We counted 141 nests, mostly empty (Table MC550-1). Nests were made of grass and forbs. We found 38 depredated eggs and 2 feather piles of adults.

Table MC550-1. Glaucous-winged Gull nests on Dugout Rocks in 1988.

Start	Empty	1E	2E	3E	Total
14	73	23	13	18	141

Pigeon Guillemot: Nine birds were present and we found 2 nests with 2 eggs each under rocks.

Associated species:

Rhinoceros Auklet - 6 flying.

Other birds and mammals sighted:

Harlequin Duck - 39 molting males.
Black Turnstone - 5
Surfbird - 3
Western Sandpiper - 5

MC-560 RUBY ROCKS

92 M/5

Location: North of Table Island, west of Brown Island.
51°18'25"N 127°49'10"W

Land status: Crown land.

Date of visit: 3 July 1988 (1035-1130 h).

Colony access: Drop-off from boat.

Observers: M. Lemon, M. Rodway, B. Carter, M. Force.

Census method: Total count.

Description: The southern of these two bare rocks has higher rock faces on the west end, and an area of boulders and a tiny shell beach on the lower east section. It is 9 m high.

Nesting species:

Pelagic Cormorant: Adults were scared off of 6 nests located on ledges on small, 2 m high, interior facing bluffs on the eastern end of the south rock. Four nests were empty, 1 contained 2 eggs and 1 held 3 eggs. The nests were not visible from the water. Nests were made of surfgrass and seaweeds. Five birds in breeding plumage and 21 in nonbreeding plumage were roosting.

Black Oystercatcher: Three nests were found: 1 empty and 1 with 1 egg on the south rock, and 1 empty on the north rock. Nests were made of barnacle and mussel shells.

Glaucous-winged Gull: We counted 69 nests, about half of which contained full clutches (Table MC560-1). Nests were made of grass and seaweed with some twigs and forbs. We found 7 depredated eggs. Thirty-five immatures were roosting on the south rock.

Table MC560-1. Glaucous-winged Gull nests on Ruby Rocks in 1988.

Location	Empty	1E	2E	3E	4E	Total
North rock	1	7	6	16		30
South rock	6	7	13	12	1	39
Total:	7	14	19	28	1	69

Pigeon Guillemot: There were 28 birds around the south rock. No nests were found.

Associated species:

Glaucous-winged-Western Gull hybrid - 1 adult.
Marbled Murrelet - 3 in summer plumage.
Rhinoceros Auklet - 1 offshore.

Other birds and mammals sighted:

Harlequin Duck - 4 males and 22 unsexed.
Black Turnstone - 9
Surfbird - 64
Western Sandpiper - 1
California Gull - 32 second and third year.

MC-590 EGG ISLAND 92 M/4,5

Location: Southwest of Table Island across Loran Pass.
51°15′N 127°50′W

Land status: Crown land.

Date of visit: 3 July 1988 (1223-1530 h).

Colony access: Drop-off from boat.

Observers: M. Lemon, M. Rodway, B. Carter, M. Force.

Census method: Total count.

Description: Rock shores and perimeter forested slopes are steep, rounding to a flatter interior. The island is a maximum of 84 m high. Dense salal under a spruce, redcedar and hemlock forest covers most of the vegetated area, but open patches of grass, Maianthemum and bare ground occur along edges. Trees have been cut around the manned lightstation on the west side.

Nesting species:

Black Oystercatcher: Two oystercatchers were roosting on the reef on the west side. We saw no evidence of nesting.

Glaucous-winged Gull: There were two nests made of grass and seaweed on shore rock at the northwest corner of the island. One nest was empty and 1 held 2 eggs. Two pairs of adults were defensive.

Pigeon Guillemot: Fifteen guillemots were in the bay on the east side of the north end, and 3 birds were flying from burrows above steep shore rock south of the large bay on the mid-east side. We suspected that a few guillemots were nesting in burrows along the east side in the same areas as Rhinoceros Auklets.

Cassin's Auklet: We found 5 isolated burrows at the south end of the island that smelled like Cassin's Auklet burrows, had fecal streaking at their entrances, and contained Cassin's Auklet abdominal feathers.

Rhinoceros Auklet: Rhinoceros Auklets were nesting along the east side of the island, where the majority of burrows (126) were counted, and on the west side about 100 m south of the lighthouse, where 3 burrows were found. Burrows were located under tree roots above steep shore rock, and had a clumped distribution along the east shore, extending a maximum of 5 m from the edge of the vegetation. One downy chick, about 15 cm long, was pulled from one burrow, and we found hatched eggshells below a number of burrows. All burrows were counted and, using the median occupancy rate for British Columbia of 77% (Rodway et al. 1988), we estimated a breeding population of 90 pairs.

Associated species:

Ancient Murrelet - 1 adult.
Northwestern Crow - 4+
River Otter - Runs and scats of fish.

Other birds and mammals sighted:

Whimbrel - 12
Rufous Hummingbird
Golden-crowned Kinglet
Orange-crowned Warbler
Fox Sparrow

MC-600 EGG ROCKS 92 M/4

Location: South of Egg Island, entrance to Alexander Passage.
51°14'35"N 127°50'W

Land status: Crown land.

Date of visit: 3 July 1988 (1200-1550 h).

Colony access: Drop-off from boat.

Observers: M. Lemon, M. Rodway, B. Carter, M. Force.

Census method: Total count.

Description: The higher of these domed islets, which rise to 14 m elevation, have lush pockets of herbaceous growth amongst projecting blocks and ridges of rock.

Nesting species:

Black Oystercatcher: We estimated 6 pairs of oystercatchers nesting. On the northern section of the main north rock, we found 1 nest with 2 eggs, 1 empty scrape that we suspected had associated chicks, and 1 pair of adults with 3 downy chicks. There was 1 nest with 3 eggs, and 1 chick with its primaries half emerged near an empty scrape on the southern portion of the main rock. An agitated pair on the small, south rock, made us suspect a nest there, though we did not locate it. Nests were made of rock chips and mussel and barnacle shells.

Glaucous-winged Gull: We tallied 140 nests, most of which contained full clutches (Table MC600-1). One clutch had just hatched. Nests were built mainly of grass with few forbs. We found 12 depredated eggs and 1 dead adult.

Table MC600-1. Glaucous-winged Gull nests on Egg Rocks in 1988.

Location	Start	Empty	1E	2E	3E	3Y	Total
Main Rock - N	1	21	6	10	59	1	98
Main Rock - S	1	8	1	1	24		35
South rock		1	2	1	3		7
Total:	2	30	9	12	86	1	140

Pigeon Guillemot: There were 18 birds around the northern rock. We located 1 nest with 1 egg under a boulder on the southern portion of the main rock.

Associated species:

Pelagic Cormorant - 1 in breeding plumage and 3 in nonbreeding plumage.

Rhinoceros Auklet - 9 offshore.

Other birds and mammals sighted:

Black Turnstone - 9
Western Sandpiper - 12
California Gull - 5 second and third year.

ISLANDS SURVEYED WITH NO HISTORY OF NESTING BY SEABIRDS

During the course of our surveys a number of islands were explored that had no evidence of nesting by seabirds. Any of those islands that had previous documentation of nesting (Rodway et al. in prep.) have been included in the main list of colonies. Those with no historical confirmation of nesting have been listed here ordered geographically from north to south. We observed seabirds (eg. Black Oystercatchers and Pigeon Guillemots) in the vicinity of some of these islands, but no evidence of nesting was obtained.

GNARLED ISLANDS 103 J/10

Location: North end of Dundas Island. 54°38'30"N 130°50'00"W

Land status: Crown land.

Date of visit: 17 May 1987 (1130-1530 h).

Observers: M. Lemon, M. Rodway, B. Carter, R. Chaundy, D. Grinnell, H. Hay, N. Holmes, C. Rodway.

Census method: Exploration.

Description: These are a small group of rocky islands with some small beaches. They are forested with spruce and have primarily open understories of Maianthemum, moss, grass, and other forbs. Hemlock and redcedar mix with spruce on larger islands, and crabapple and patches of shrubbery, including salal, salmonberry and devil's club are abundant on some edges. There is a stand of large redcedars, some of which have signs of old bark stripping, on the south side of the large, central island.

Sightings:

Common Loon - 1
Harlequin Duck - 7 male, 2 females
Surf Scoter - 19
White-winged Scoter - 4

Bald Eagle - 3 nests:
1. 20 m high in 30 m spruce on small islet at east end of largest central island; adults calling, one in nest.
2. 15 m high in 25 m spruce 8 m from shore on southeast island; nest held 2 eggs; 2 adults were present.

3. 18 m high in 20 m spruce near shore on east island, adult perched on nest.

Peregrine Falcon - 1
Black Oystercatcher - 5; 3 empty scrapes on north islets
Wandering Tattler - 2
Spotted Sandpiper - 2
Glaucous-winged Gull - 4 adults
Pigeon Guillemot - 5; 2 just off northwest islet, 3 flying west.
Marbled Murrelet - 5 in summer and 1 in winter plumage.
Rufous Hummingbird - 7+

Northwestern Crow - 35 birds; 3 empty nests; 4 nests with 3 eggs each: one 2 m high in 3 m cedar tree, lined with cedar bark and grass; one 4 m high in 6 m spruce tree, lined with cedar bark and moss; one 2 m high in 3 m spruce, lined with grass, lichens and cedar bark; and one 3 m high in spruce, lined with cedar bark, moss and arborial lichens.

Olive-sided Flycatcher - 1
Western Flycatcher - 2
Winter Wren - 2
Golden-crowned Kinglet - 1 male
Hermit Thrush - 1
Orange-crowned Warbler - 4
Wilson's Warbler - 2
Savannah Sparrow - 10+
Fox Sparrow - 2
Song Sparrow - 9+
Golden-crowned Sparrow - 10

Harbour Seal - 12 adults, 3 young
River Otter - Runs and scats
Mink - Many burrows and trails, lots of shells

WHITE ISLANDS 103 J/10

Location: Off northwest corner of Dundas Island.
54°38'06"N 130°55'00"W

Land status: Crown land.

Date of visit: 17 May 1987 (1600-1830 h).

Observers: M. Lemon, M. Rodway, B. Carter, R. Chaundy, D. Grinnell, H. Hay, N. Holmes, C. Rodway.

Census method: Exploration.

Description: Similar to the Gnarled Islands, White Islands are a small group of rocky islands forested with spruce and some hemlock. Understories are more open on northern exposures with Maianthemum, moss, grass, and other forbs, but most areas are dense with salal and other shrubs, especially on western and southern sides.

Sightings:

Harlequin Duck - 1 male, 1 female

Common Merganser - 1 female

Red-breasted Merganser - female

Bald Eagle - 1 adult flying around nest; nest 25 m high in the forked top of a 35 m hemlock in the middle of the north end, 40 m from the west shore.

Spotted Sandpiper - 1
Glaucous-winged Gull - 3 adults
Marbled Murrelet - 4
Rufous Hummingbird - 1 male, 1 female
Western Flycatcher
Northwestern Crow - 8
Common Raven - 1
Chestnut-backed Chickadee
Winter Wren
Hermit Thrush
American Robin - 1
Savannah Sparrow - 4+
Song Sparrow
Fox Sparrow
Golden-crowned Sparrow

Beaver - We found fresh signs on the southwest island. All crabapple trees on the northwest point, and fresh boughs of salal, spruce, false azalea, and devil's club had been cut. A large stockpile of salal branches had been gathered at the base of a rock bluff where a small seepage stream emerged. Nearby, the beaver had recently worn out a small muddy pool.

Mink - Burrows and trails.
River Otter - 1
Sea Lion - 1

HOLLIDAY ISLAND 103 J/10

Location: Off northeast corner of Dundas Island.
54°37′24"N 130°45′30"W

Land status: Crown land.

Date of visit: 17 May 1987 (1040-1115 h).

Observers: M. Lemon, M. Rodway, B. Carter, R. Chaundy, D. Grinnell, H. Hay, N. Holmes, C. Rodway.

Census method: Exploration.

Description: Holliday is a small island composed of two, low knobs vegetated with Maianthemum, grass, and some twinberry under a spruce forest.

Sightings:

Pigeon Guillemot - 2 flying past.
Northwestern Crow - 4
Common Raven - 1 flying, carrying food.
Savannah Sparrow - 3 on tidal rocks.

Mink - Abundant sign: crabshell, paths and burrows.
Dall Porpoise - 8 following boat.

WHITESAND ISLAND 103 J/10

Location: Northeast of Randall and Baron islands.
54°30′45"N 130°45′00"W

Land status: Crown land.

Date of visit: 13 May 1987.

Observers: M. Lemon, R. Chaundy, N. Holmes, C. Rodway.

Census method: Exploration.

Description: This is a low island encircled by shell beach. The island is vegetated with Elymus, cow parsnip and other forbs, plus three windblown spruce trees with Maianthemum underneath.

Sightings:

Canada Goose - 2 flying

Harlequin Duck - 1 male, 2 females

Semipalmated Plover - 1

Black Oystercatcher - 4 birds, 4 empty scrapes on shell beach. Possibly nesting later in the season.

Wandering Tattler - 1
Ruddy Turnstones - 8
Surfbird - 2
Rock Sandpiper - 20
Marbled Murrelet - 3 pairs
Water Pipit - 1
Wilson's Warbler
Savannah Sparrow - 6
Fox Sparrow - 1
Song Sparrow - 8
Golden-crowned Sparrow

Harbour Seal - 4

DUCIE ISLAND 103 J/10

Location: Northeast of Baron Island, west of Whitesand Island.
54°30'44"N 130°46'17"W

Land status: Crown land.

Date of visit: 13 May 1987 (1115-1215 h).

Observers: M. Lemon, R. Chaundy, N. Holmes, C. Rodway.

Census method: Exploration.

Description: Ducie is a small limestone island with a spruce forest. It has an open understory of Maianthemum with patches of salmonberry, elderberry, twinberry and devil's club.

Sightings:

Harlequin Duck - 1 pair

Bald Eagle - 1

Northwestern Crow - 3 birds; 1 nest 3 m high in spruce near shore and 3 nests in elderberry.

Common Raven - 1
Rufous Hummingbird
Chestnut-backed Chickadee
Winter Wren
Song Sparrow

River Otter - runs
Mink - suspected burrows

NARES ISLETS 103 J/10

Location: Southeast side of Dundas Island, between Dundas and Baron islands. 54°30'55"N 130°49'30"W

Land status: Crown land; northeast islands are Indian Reserves.

Date of visit: 13 May 1987 (1530-1730 h).

Observers: M. Lemon, M. Rodway, B. Carter, R. Chaundy, D. Grinnell, H. Hay, N. Holmes, C. Rodway.

Census method: Exploration. We checked smaller islets and points of large islets at the northeast end of the group.

Description: These are rocky islands, with some shell beaches, forested by hemlock, spruce and redcedar. Understories on smaller islands are primarily Maianthemum, grass and other forbs. Salal becomes dense on larger islets, giving way to bare litter and moss in interior areas with closed canopies.

Sightings:

Canada Goose - 2 flying by.

Harlequin Duck - 4 male, 3 female, 7 unsexed.

Bald Eagle - 1 nest 25 m high in spruce, 15 m from shore near the east end of the small, 30 m high islet on the east side of the group. 1 adult sitting in nest. Also 1 immature sighted.

Black Oystercatcher - 14 on tidal rock.
Wandering Tattler - 4
Spotted Sandpiper - 1
Ruddy Turnstone - 2
Glaucous-winged Gull - 6 roosting.
Rufous Hummingbird
Northwestern Crow - 7
Common Raven - 2
Varied Thrush

Mink - Burrows with crabshells, scats and paths.
River Otter - Lots of scats and runways.

BARON ISLAND 103 J/7

Location: Off southeast side of Dundas Island.
54°29'00"N 130°48'00"W

Land status: Crown land.

Date of visit: 12-19 May 1987 (camp on northeast corner).

Observers: M. Lemon, M. Rodway, B. Carter, R. Chaundy, D. Grinnell, H. Hay, N. Holmes, C. Rodway.

Census method: Exploration. We explored the shoreline area around the northeast corner where our camp was located, the interior from camp to about 2 km inland on 14 May, and boated around most of the east and northwest sides, including the large lagoon on the mid-northwest side on 15 May.

Description: Baron Island has a rocky shoreline with pocket beaches at the heads of bays. Perimeter areas are forested with hemlock, spruce and redcedar and have dense salal understories. There is extensive pine/cedar bog habitat with many shallow ponds and small lakes in the interior.

Sightings:

Red-throated Loon - 1 in winter plumage and 1 in breeding plumage off camp; 3 in breeding plumage in lagoon.

Pacific Loon - 12 on northwest side

Common Loon - 4 in winter plumage, 1 in breeding plumage.

Horned Grebe - 1 in breeding plumage

Red-necked Grebe - 1 in breeding plumage

Double-crested Cormorant - 2

Pelagic Cormorant - 2 in nonbreeding plumage

Great Blue Heron - 1 flying

Canada Goose - 2 heard calling from camp most days; feeding on tidal flats. 1 scared off interior pond; old eggshells found in area.

Mallard - 1 male

Harlequin Duck - 3 pairs

Oldsquaw - 1 calling

Surf Scoter - 1 male

White-winged Scoter - 10

Hooded Merganser - 1 pair on interior pond.

Common Merganser - 3 females

Bald Eagle - Maximum of 2 adults, 1 immature. 1 nest on point south of Calm Inlet.

Red-tailed Hawk - 2

Black Oystercatcher - 2 flying

Greater Yellowlegs - 1 flying and calling in interior.

Spotted Sandpiper - 1

Whimbrel - 8

Dowitcher sp. - 8 feeding on edge of interior pond.

Glaucous-winged Gull - 4 adults, 1 immature

Pigeon Guillemot - 3 in northeast bay on 13 May

Marbled Murrelet - Maximum of 20 seen off the northwest side on 15 May. All but one in breeding plumage.

Northern Saw-whet Owl - 1 calling
Rufous Hummingbird - 1 pair

Belted Kingfisher - 2
Western Flycatcher
Tree Swallow - 12
Northwestern Crow - 6
Common Raven - 2
Winter Wren
Ruby-crowned Kinglet
Hermit Thrush
Varied Thrush
Orange-crowned Warbler
Savannah Sparrow
Song Sparrow
Dark-eyed Junco
Red Crossbill

Mink - 2 screaming around camp; trails and scats.
River Otter - 1 eating fish in camp bay.
Beaver - Dams, trails and cuttings abundant in the interior.
Harbour Seal - 1

MOFFAT ISLANDS 103 J/7

Location: East of Dunira Island. 54°28′26"N 130°44′48"W

Land status: Crown land.

Date of visit: 13 May 1987 (1120-1230 h).

Observers: M. Rodway, B. Carter, D. Grinnell, H. Hay.

Census method: Exploration. We checked the south point of the large island at the north end of the chain (southeast of Randall Island) and explored three small islets just south of it.

Description: The Moffats are a chain of rocky islands extending along the east side of Dunira and the north end of Melville islands. They are forested with hemlock, redcedar and a few large spruce. There are redcedar snags and live trees up to 1.5 m dbh. One old redcedar stump was suspected to have been cut by natives. Understory vegetation varies between dense salal and open areas of Maianthemum, grass, moss, and other forbs.

Sightings:

Canada Goose - Suspected from droppings.

Harlequin Duck - 2 males
Bald Eagle - 1 subadult
Wandering Tattler - 2
Belted Kingfisher - 1 female
Common Raven - 1
Chestnut-backed Chickadee
Winter Wren
Hermit Thrush
Orange-crowned Warbler
Song Sparrow

Mink - 1 seen; crabshell scats.
River Otter - 1 seen

ARCHIBALD ISLANDS 103 J/2

Location: Off the northwest corner of Stephens Island, south of Tree Nob Group. 54°12'30"N 130°50'00"W

Land status: Crown land.

Date of visit: 21 May 1987 (1115-1520 h).

Observers: M. Lemon, B. Carter, R. Chaundy, D. Grinnell, H. Hay, N. Holmes.

Census method: Exploration.

Description: This cluster of islands have steep, rocky shores of eroded granite with some beaches in chute bays. Windswept salal and redcedar shrub cover much of the islands under forests of hemlock, spruce and redcedar. Maianthemum and other forbs grow on open edges. Ground cover is bare litter in interior areas under closed canopy.

Sightings:

Harlequin Duck - 2 male, 3 female.

Bald Eagle - 1 adult; 1 nest with 2 small (10 cm) chicks on the southeast islet inspected on 21 May. Nest was 18 m high in 20 m spruce and was lined with grass. There was a whole, 30 cm long fish in the nest.

Black Oystercatcher - 2 copulating on southeast rocks. No nest was found.

Yellowlegs sp. - 1

Whimbrel - 3 flying by; 1 on rock.

Glaucous-winged Gull - 1 pair on south rocks.

Pigeon Guillemot - 8 off east side of south islet.

Rufous Hummingbird

Belted Kingfisher - 2 flying in and out of a burrow at the top of a cliff under overhanging vegetation.

Northwestern Crow - 8 birds; 3 nests found: one empty nest, 7 m high in spruce tree; one with 1 egg, 1.3 m high in 2 m spruce, lined with grass, redcedar bark and feathers; and one with 2 eggs, 7 m high in spruce tree, lined with redcedar bark and lichen.

Western Flycatcher
Winter Wren
Wilson's Warbler
Song Sparrow
Fox Sparrow

Mink - 3 seen; numerous burrows with crabshells and pathways.
River Otter - Dens, runs and scats of fish.
Harbour Seal - 1

"PHILIP" ROCK 103 J/2

Location: South of Philip Island. 54°08'15"N 130°48'55"W

Land status: Crown land.

Date of visit: 22 May 1987 (1130 h).

Observers: M. Lemon, M. Rodway, B. Carter, R. Chaundy, D. Grinnell, C. Rodway.

Census method: We boated around the rock.

Description: This 16 m high rock is mostly bare with little grass patches.

Sightings: No seabirds were seen.

CRUICE ROCK 103 J/1

Location: Off the north end of Lawyer Islands.
54°06'58"N 130°20'40"W

Land status: Crown land.

Date of visit: 27 May 1987 (1400 h).

Observers: R. Chaundy.

Census method: Observed by binoculars from Lawyer Islands.

Description: Cruice is a low, 0.3 m high rock. It is probably wave-washed.

Sightings:

Harlequin Duck - 1 pair
White-winged Scoter - 2 female
Glaucous-winged Gull - 6 adults roosting

ALICE ISLAND 103 J/1

Including islets to south.

Location: Off the north point of Porcher Island.
54°06'03"N 130°26'55"W

Land status: Crown land.

Date of visit: 27 May 1987 (1410-1610).

Observers: M. Rodway, B. Carter.

Census method: Exploration. We explored Alice Island and the cluster of 3 islets, 46, 32, and 21 m high, south of Alice Island.

Description: Dense salal forms much of the understory of the hemlock, spruce and redcedar forests on these islands. Extensive patches of *Maianthemum* occur on perimeter sections of Alice Island, and open, mossy and bare litter areas occur in the interior of other islands explored. There were many old stumps from cut trees on the perimeter of the 46 m islet.

Sightings:

Bald Eagle - 1 nest at south end of Alice Island, 30 m high in 50 m hemlock, 50 m from east side of island. 1 adult present.

Glaucous-winged Gull - 2 adults on rock east of 21 m islet.
Common Raven - 1
Hermit Thrush
Savannah Sparrow

Mink - 1 seen; numerous burrows with scats and crab remains in vicinity.
River Otter - Den at the northeast corner of Alice Island.

ROD ISLAND 103 J/2

Location: Off the south end of Joyce Island, south of Stephens Island. 54°05'37"N 130°41'08"W

Land status: Crown land.

Date of visit: 22 May 1987 (1300 h).

Observers: M. Lemon, M. Rodway, R. Chaundy, C. Rodway.

Census method: We only boated around the island.

Description: Habitat appeared similar to Archibald Islands with dense salal under hemlock, spruce and redcedar forest extending right to the edge of the steep shore rock.

Sightings: No birds were seen.

CREAK ISLANDS 103 J/1

Location: On the north side of Porcher Island, east of Refuge Bay. 54°05'00"N 130°29'30"W

Land status: Crown land.

Date of visit: 22 May 1987 (1230-1400 h).

Observers: M. Rodway, B. Carter, C. Rodway.

Census method: Exploration. We explored the outer, northwest, 61 m high island, and the small islet off its southeast side.

Description: The outer island has level areas near shore and abruptly raised, rocky knolls in the interior. The forest changes from primarily hemlock/spruce on the north end to primarily redcedar/hemlock at the south end. Ground cover is open bare litter and Maianthemum with scattered patches of salal and hemlock seedlings. Small windfalls have occurred in the centre of the island and some trees have been logged. There were signs of cedar bark stripping. False azalea dominates the ground cover under redcedar forest on the small islet.

Sightings:

Bald Eagle - 1 skeleton found; 1 nest 40 m high in 55 m hemlock, 15 m from shore. 1 adult present.

Hermit Thrush

Mink - Paths, burrows and scats of crabshell.

River Otter - Runs, dens and scats of fish. The ground on the small islet was worn bare by river otters.

Squirrel - Suspected from spruce cone chewings.

"HENRY" ISLET 103 J/2

Location: East of Henry Island at the north mouth of Welcome Harbour. 54°01'36"N 130°37'55"W

Land status: Crown land.

Date of visit: 22 May 1987 (1330-1400 h).

Observers: M. Lemon, M. Rodway, R. Chaundy, C. Rodway.

Census method: Exploration.

Description: This 33 m high island is covered with 1 m high salal under spruce around the perimeter, changing to a more open understory under redcedar in the interior.

Sightings:

Harlequin Duck - 1 male flying
Winter Wren
Song Sparrow
Mink - Burrows with crabshell inside.
River Otter - Runs and scats of fish.

FOG ISLANDS 103 J/2

Location: South of Henry Island at the northwest corner of Porcher Island. 54°00'20"N 130°41'00"W

Land status: Crown land.

Date of visit: 22 May 1987 (1345-1430 h).

Observers: B. Carter, D. Grinnell, H. Hay, N. Holmes.

Census method: Exploration.

Description: These are low, flat islands with salal and patches of Maianthemum and grass around perimeters, and some open mossy and bare litter areas in the interior.

Sightings:

Harlequin Duck - 5
Bald Eagle - 2
Yellowlegs sp. - 1
Rufous Hummingbird
Northwestern Crow - 4
Common Raven - 1
Golden-crowned Sparrow - 8

Mink - 1 seen; numerous burrows with crab remains and frequent pathways.

River Otter - Runs and scats of fish.

BASS ROCK 103 G/15

Location: Off Oval Point on the west side of Porcher Island. 53°56'00"N 130°43'45"W

Land status: Crown land.

Date of visit: 22 May 1987 (2030 h).

Observers: M. Rodway, C. Rodway.

Census method: Exploration.

Description: Bass is a 9 m high rock.

Sightings:

Pelagic Cormorant - 75 roosting on west side.

OVAL POINT 103 G/15

Location: West side of Porcher Island. 53°56'00"N 130°43'15"W

Land status: Crown land.

Date of visit: 22-24 May 1987.

Observers: M. Lemon, M. Rodway, B. Carter, R. Chaundy, D. Grinnell, H. Hay, N. Holmes, C. Rodway.

Census method: Exploration.

Description: Either side of Oval Point are extensive sandy beaches embraced by rocky points.

Sightings:

Pacific Loon - 20 between Oval Point and Cape George on 24 May.

Pelagic Cormorant - 25 nonbreeding birds between Oval Point and Cape George on 24 May.

Brant - 8

Harlequin Duck - 6 males, 12 females on 23 May; 6 males, 9 females on 24 May.

Oldsquaw - 10 males, 10 females and 12 males in partial eclipse plumage between Oval Point and Cape George on 24 May.

White-winged Scoter - 83 on 22 May; 40 between Oval Point and Cape George on 24 May.

Common Merganser - 15 between Oval Point and Cape George on 24 May.

Bald Eagle - 1 nest 30 m high in 40 m spruce, 100 m from shore. One adult perched in adjacent tree.

Rough-legged Hawk - 1

Black-bellied Plover - 4

Semipalmated Plover - 5 on 22 May; 6 on 23 May.

Black Oystercatcher - 44 on tidal rocks on 22 May; 17 on 23 May.

Spotted Sandpiper - 3

Whimbrel - 59 on 22 May; 46 on 23 May foraging at high tide rocks.

Western Sandpiper - 37 on 23 May foraging at high tide line with Semipalmated Plovers.

Peeps - 25

Herring Gull - 1 immature

Glaucous-winged Gull - 30

Common Murre - 1 in summer plumage between Oval Point and Cape George on 24 May.

Pigeon Guillemot - 2 between Oval Point and Cape George on 24 May.

Marbled Murrelet - 72 between Oval Point and Cape George on 24 May. All summer plumage except 1 molting.

Rhinoceros Auklet - 2 between Oval Point and Cape George on 24 May.

Rufous Hummingbird
Northern Flicker - calling
Northwestern Crow - 5
Common Raven - 2
American Robin - 2
Orange-crowned Warbler
Townsend's Warbler
Savannah Sparrow - 25 on beach rocks on 23 May.
Song Sparrow

Mink - 1 seen; burrows on knob vegetated with Maianthemum and salal.

Sitka Deer
Squirrel - Calling; spruce cone chewings.
Harbour Seal - 1

GRASSY ISLAND 103 G/16

Location: Northwest of Kitkatla Islands. 53°48'22"N 130°23'52"W

Land status: Crown land.

Date of visit: 25 May 1987 (1620-1640 h).

Observers: M. Lemon, M. Rodway, B. Carter, R. Chaundy, D. Grinnell, H. Hay, N. Holmes, C. Rodway.

Census method: Exploration.

Description: This is a small, flat-topped island surrounded by shell beach. It is an old native midden and burial ground grown over by forbs and shrubs.

Sightings:

Red-necked Grebe
Greater Scaup - 70
Harlequin Duck - 12
Surf Scoter - 15

SHAKES ISLANDS 103 G/15

Location: Off the east side of Goschen Island.
53°48'18"N 130°30'20"W

Land status: Crown land.

Date of visit: 24-25 May 1987 (camp on the most western island).

Observers: M. Lemon, M. Rodway, B. Carter, R. Chaundy, D. Grinnell, H. Hay, N. Holmes, C. Rodway.

Census method: Exploration. We explored the west island.

Description: These islands have rocky shores with some small beaches. Salal predominates under forests of hemlock, spruce and redcedar.

Sightings:

Canada Goose - 2

Harlequin Duck - 3 males, 2 females.

Surf Scoter - 13

White-winged Scoter - 1 male

Sandhill Crane - 2 flying over.

Bald Eagle - 5 adults or subadults, 2 immature; 2 nests:
1. 20 m high in 40 m spruce, 50 m from shore on the north end of the west island. Adult in nest.
2. 10 m high in 20 m spruce, 5 m from shore on the small islet on the northwest side of the west island. One adult in nest and another perched in adjacent tree.

Rough-legged Hawk - 1 light colored.
Rufous Hummingbird - courtship flight.
Belted Kingfisher - 2
Northern Flicker - calling
Chestnut-backed Chickadee
Golden-crowned Kinglet
Hermit Thrush
Townsend's Warbler
Wilson's Warbler

MOORE ISLAND 103 G/15

Location: North of Prager Islands off the southeast side of Goschen Island. 53°47'20"N 130°31'10"W

Land status: Crown land.

Date of visit: 25 May 1987 (1800 h).

Observers: M. Lemon, H. Hay, N. Holmes, C. Rodway.

Census method: We boated around the island.

Description: Vegetation is primarily salal under redcedar with some Maianthemum on edges.

Sightings:

Bald Eagle - 2 adults.

PRAGER ISLANDS 103 G/15

Including small islets to east off the west side of Dolphin Island.

Location: Off the southeast side of Goschen Island.
53°46'00"N 130°31'30"W

Land status: Crown land.

Date of visit: 25 May 1987 (1100-1700 h).

Observers: M. Lemon, H. Hay, N. Holmes, C. Rodway.

Census method: Exploration. We explored two small islets at the southwest end of Prager Islands and five small islets east of Prager Islands.

Description: Forest is mostly redcedar with some hemlock and spruce. Salal covers most areas and small patches of crowberry, grass, Mainthemum and other forbs grow on edges. Sitka Alder also occurs on perimeters.

Sightings:

Red-necked Grebe - 1

Pelagic Cormorant - 3 roosting on tidal rock.

Oldsquaw -1 pair.

Surf Scoter - 15 flying.

White-winged Scoter - 1

Red-breasted Merganser - 10

Bald Eagle - 1 nest 25 m high in 30 m spruce near centre of 38 m islet east of Prager Islands. 2 adults at nest.

Black-legged Kittiwake - 1 feather pile of immature.
Glaucous-winged Gull - 10 immatures flying by.
Marbled Murrelet - 2
Rufous Hummingbird
Belted Kingfisher - 1
Western Flycatcher
Northwestern Crow - 7 birds; 2 nests 10 m high in 15 m redcedar.
Chestnut-backed Chickadee - 3
Winter Wren
Hermit Thrush
Orange-crowned Warbler
Savannah Sparrow
Fox Sparrow

Mink - Burrows and scats.
River Otter - Runs

BARREN ROCKS 103 G/15

Location: West of Prager Islands off the southeast side of Goschen Island. 53°46′00"N 130°32′38"W

Land status: Crown land.

Date of visit: 25 May 1987 (1700-1730).

Observers: M. Lemon, H. Hay, N. Holmes, C. Rodway.

Census method: Exploration.

Description: Rocks are smooth and convoluted with sparse grass and *Cochlearia*.

Sightings:

Pelagic Cormorant - 8 nonbreeding.
Harlequin Duck - 1 male, 2 females.
Black Oystercatcher - 2 displaying; no nest found.
Wandering Tattler - 1
Glaucous-winged Gull - 12 immatures.

SENTINEL ISLET 103 G/9

Including cluster of tidally connected islets to northeast.

Location: Southwest of Dolphin Island. 53°44'54"N 130°28'55"W

Land status: Crown land.

Date of visit: 25 May 1987 (1700-1730 h).

Observers: M. Rodway, B. Carter, R. Chaundy, D. Grinnell.

Census method: Exploration.

Description: Vegetation is primarily salal under spruce with some crowberry, grass and *Maianthemum* on edges.

Sightings:

Glaucous-winged Gull - 1
Rufous Hummingbird
Northwestern Crow - 2
Song Sparrow

Mink - Burrows and scats of crabshell and feathers.
River Otter - Runs and scats of fish.

CHRISTIE ISLANDS 103 G/9

Location: West side of McCauley Island, west of South Spicer Island. 53°44'00"N 130°24'30"W

Land status: Crown land.

Date of visit: 25 May 1987 (1600.

Observers: M. Rodway, B. Carter, R. Chaundy, D. Grinnell.

Census method: Exploration. We explored the southwest and three west islands and boated around the east islands.

Description: The outer islands are primarily salal under spruce with some crowberry, grass and Maianthemum on edges. Redcedar with salal understory predominates on larger east islands.

Sightings:

Bald Eagle - 1 adult.
Northwestern Crow - 3
Song Sparrow

Mink - Burrows and scats.
River Otter - Runs and scats of fish.

FRIDAY ISLAND 103 G/9

Location: West side of McCauley Island, southwest of South Spicer Island. 53°43'25"N 130°23'45"W

Land status: Crown land.

Date of visit: 25 May 1987 (1555 h).

Observers: M. Rodway, B. Carter, R. Chaundy, D. Grinnell.

Census method: We only boated around the island.

Description: Friday Island is densely vegetated by salal under redcedar and hemlock forest.

Sightings: No birds were seen.

RALPH ISLANDS 103 G/9

Location: West side of McCauley Island, southwest of South Spicer Island. 53°43'00"N 130°25'00"W

Land status: Crown land.

Date of visit: 25 May 1987 (1400-1540 h).

Observers: M. Rodway, B. Carter, R. Chaundy, D. Grinnell.

Census method: Exploration.

Description: Forest is mostly redcedar with some hemlock and spruce. Salal covers most areas and small patches of scrub redcedar and crowberry grow on edges. Sitka Alder also occurs on perimeters.

Sightings:

Harlequin Duck - 2 males, 1 female.
Wandering Tattler - 1
Herring Gull - 1 feather pile of adult.
Western Flycatcher
Northwestern Crow
Winter Wren
Hermit Thrush
Orange-crowned Warbler

Mink - Burrows and scats of crabshell.

River Otter - 1 seen; dens and runs on southwest corner of main island.

Harbour Seal - 1

WHITE ROCKS 103 G/10

Including small islets to southwest.

Location: Off the northwest tip of Banks Island.
53°38'00"N 130°33'55"W

Land status: Crown land.

Date of visit: 25 May 1987 (1110-1200 h).

Observers: M. Rodway, B. Carter, R. Chaundy, D. Grinnell.

Census method: Exploration. We explored White Rocks and two small vegetated islets southwest of White Rocks, just east of Archie Rock.

Description: These rocks are steep-sided white granite. The larger islet of the White Rocks and the southwest islets are vegetated predominantly by salal under spruce forest with small patches of grass and Maianthemum on perimeters and some interior areas of bare litter under redcedar and hemlock.

Sightings:

Harlequin Duck - 3 pair.

White-winged Scoter - 1

Bald Eagle - 1 nest 25 m high in 35 m snag on southeast end of islet due east of Archie Rock.

Pigeon Guillemot - 1 flying past west edge of Larson Island.
Ancient Murrelet - 1 wing and feather pile.
Belted Kingfisher - 1
Western Flycacher - 4
Northwestern Crow - 4
Chestnut-backed Chickadee
Winter Wren
Yellow Warbler - singing.
Song Sparrow

Mink - 2 seen; dens, numerous burrows and scats of crabshell.

River Otter - Large den on southeast corner of islet due east of Archie Rock. Many runs and scats of fish.

ARCHIE ROCK 103 G/10

Location: Off the northwest tip of Banks Island.
53°37'07"N 130°35'40"W

Land status: Crown land.

Date of visit: 25 May 1987 (1130 h).

Observers: M. Rodway, B Carter, R. Chaundy, D. Grinnell.

Census method: Viewed from boat.

Description: Archie is a 7 m high granitic rock.

Sightings: No birds were seen.

WELLS ISLET 103 G/10

Location: Off the northwest tip of Banks Island.
53°34'48"N 130°34'55"W

Land status: Crown land.

Date of visit: 25 May 1987 (1230-1306 h).

Observers: M. Rodway, B. Carter, R. Chaundy, D. Grinnell.

Census method: Exploration.

Description: Shores are steep granite. Grass and Maianthemum form much of the understory of the spruce forest with dense salal growing on high sections of the islet.

Sightings:

Bald Eagle - 1 nest 25 m high in 30 m spruce on mid-west side. 1 adult in nest.

Northwestern Crow - 8
Yellow Warbler

Mink - Burrows and scats of crabshell.
River Otter - Runs and scats of fish.

"KETTLE" ISLET 103 A/11

Location: The outer northwest islet off the mouth of Kettle Inlet.
52°42'34"N 129°17'10"W

Land status: Crown land.

Date of visit: 11 June 1988 (1100-1200 h).

Observers: M. Rodway, D. Grinnell.

Census method: Viewed from boat.

Description: This is a rocky islet with grass under a spruce forest on top.

Sightings: No seabirds were seen on the island.

Canada Goose - 3 flying up Kettle Inlet.

Common Merganser - 1 female.

Bald Eagle - 1 nest 20 m high in 25 m spruce, 20 m from southeast corner. 2 adults perched in adjacent tree.

Marbled Murrelet - 110 off the mouth of Kettle Inlet.

SOUTH ARRIAGA ISLAND 103 A/11

Location: West of Weeteeam Bay on Aristazabal Island.
52°30′25"N 129°06′20"W

Land status: Crown land.

Date of visit: 24 June 1988 (1400 h).

Observers: M. Lemon, M. Rodway, B. Carter, M. Force.

Census method: Viewed from boat.

Description: This 39 m high island is forested with spruce and has extensive open understory of *Maianthemum*.

Sightings: No seabirds were seen on South Arriaga Island or on adjacent rocks.

Bald Eagle - 1 nest 15 m high in 25 m spruce, 20 m from shore. 1 adult perched nearby.

JAFFREY ROCK 103 A/7

Location: West of the north end of Price Island, southwest of Higgins Passage. 52°27′32"N 128°49′17"W

Land status: Crown land.

Date of visit: 24 June 1988 (1600 h).

Observers: M. Lemon, M. Rodway, B. Carter, M. Force.

Census method: Viewed from boat.

Description: Jaffrey is a low rock with a light beacon on top. It is probably wave-washed.

Sightings: There were no birds on the rock.

SUSAN ROCK 103 A/7

Location: Milbanke Sound west of Seaforth Channel.
52°17′12"N 128°30′18"W

Land status: Crown land.

Date of visit: 24 June 1988 (1130 h).

Observers: M. Lemon, M. Rodway, B. Carter, M. Force.

Census method: Viewed from boat.

Description: Susan is a low rock with a light beacon on top. It is probably wave-washed.

Sightings: No birds were seen.

MCMULLIN GROUP 103 A/1

Location: North of Goose Island, southwest of Stryker Island. 52°02'14"N 129°24'33"W

Land status: Crown land.

Date of visit: 28 June 1988 (0930 h).

Observers: M. Lemon, M. Rodway, B. Carter, M. Force.

Census method: We explored only the west rocks.

Description: The outer west rocks are bare.

Sightings: There were no gulls present.

Pelagic Cormorant - 5 in nonbreeding plumage.
Harlequin Duck - 25, mostly males.
Bald Eagle - 1 perched on rocks.
Marbled Murrelet - 16 in summer plumage.

PURPLE BLUFF 102 P/16

Location: On the western Island of the Simonds Group, east of Goose Island. 51°56'20"N 128°18'00"W

Land status: Crown land.

Date of visit: 29 June 1988 (1945 h).

Observers: M. Lemon, M. Rodway, B. Carter, M. Force.

Census method: Viewed from boat.

Description: Cliffs.

Sightings: We saw no evidence of nesting by seabirds. There was guano streaking on the south facing cliffs but no cormorants were present.

Pigeon Guillemot - 1 just offshore.
Marbled Murrelet - 6 just offshore.

GRANVILLE ISLANDS 102 P/16

Location: South of the Simonds Group, west of the McNaughton Group. 51°55′12"N 128°16′40"W

Land status: Crown land.

Date of visit: 29 June 1988 (2030 h).

Observers: M. Lemon, M. Rodway, B. Carter, M. Force.

Census method: Viewed from boat.

Description: The main island is forested, and the small islands are mostly bare rock.

Sightings: No birds were seen.

"SPIDER" ROCKS 102 P/16

Location: Off the north and east sides of Spider Island. 51°51′48"N 128°15′25"W

Land status: Crown land.

Date of visit: 29 June 1988 (2100 h).

Observers: M. Lemon, M. Rodway, B. Carter, M. Force.

Census method: Viewed from boat.

Description: Bare rocks.

Sightings: No birds were seen.

"EDNA" ROCKS 102 P/16

Location: West of Edna Island in the Breadner Group.
51°49'06"N 128°15'40"W

Land status: Crown land.

Date of visit: 29 June 1988 (2120 h).

Observers: M. Lemon, M. Rodway, B. Carter, M. Force.

Census method: Viewed from boat.

Description: Bare rocks.

Sightings: No birds were seen.

CALVERT ISLAND 102 P/9

Location: South of Hakai Passage. 51°39'45"N 128°08'30"W

Land status: Crown land.

Date of visit: 1-2 July 1988.

Observers: M. Lemon, M. Rodway, B. Carter, M. Force.

Census method: We camped in the north bay on the northwest corner of the island. We explored only that beach, the adjacent beach on the west coast, and the forested area between.

Description: Inland from the extensive sandy beaches is hemlock, spruce and redcedar forest. In the interior are small ponds.

Sightings:

Common Loon - 18 winter plumage, molting.
Surf Scoter - 55
White-winged Scoter - 5
Bald Eagle - 1 adult.
Sharp-shinned Hawk - 1
Black-bellied Plover - 44 flying.
Semipalmated Plover - 4 adults.
Semipalmated Sandpiper -2 adults.

Western Sandpiper - 23 adults.
Least Sandpiper - 2 adults.
Mew Gull - 60, adults and second year birds.
California Gull - 1 second year bird.
Glaucous-winged Gull - 5 immature.
Caspian Tern - 2 adults flying and calling.
Rufous Hummingbird - 2
Belted Kingfisher - 2 fledglings and a female carrying fish.
Hairy Woodpecker - 1 adult feeding 1 young.
Western Flycatcher
Tree Swallow
Barn Swallow
Northwestern Crow
Common Raven
Chestnut-backed Chickadee
Brown Creeper
Winter Wren
Golden-crowned Kinglet
Hermit Thrush - 2 juveniles.
American Robin
Varied Thrush
Orange-crowned Warbler - 1 adult feeding 1 young plus 2 other family groups heard.
Yellow-rumped Warbler
Townsend's Warbler
Wilson's Warbler
Fox Sparrow
Dark-eyed Junco
Red Crossbill
Pine Siskin

Killer Whale - Family of 7: 1 male, 1 female and 5 little ones.

SUMMARY AND CONCLUSIONS

The Northern Mainland Coast supports a seabird nesting population of about 390,000 birds breeding at 60 sites. Rhinoceros Auklets comprise 60% of the total population, and Fork-tailed Storm-Petrels, Leach's Storm-Petrels and Cassin's Auklets compose another 38% (Table MC-1). The most important concentrations occur off the west coast of Aristazabal Island in the vicinity of the Moore Islands, where over 332,000 birds nest (85%), and on Lucy and Rachael islands in central Chatham Sound, where almost 52,000 birds nest (13%). Table MC-1 includes data for a few small colonies of Black Oystercatchers, Glaucous-winged Gulls and Pigeon Guillemots not surveyed since 1976. Population estimates from 1976 (Rodway _et al_. in prep; British Columbia Nest Record Scheme) for those colonies have been included to present total estimates for the region. Historical data interpreted in Rodway _et al_. (in prep) has been used to list extinct or unused colonies.

Comparing historical and current records reveals changes in the nesting populations or distribution of some species. Glaucous-winged Gulls increased by almost 50% between 1976/77 (2236 pairs) and 1988 (3327 pairs), while Pelagic Cormorants and Tufted Puffins have decreased (Rodway _et al_. in prep). Though larger numbers of gulls were breeding in 1988, there was considerable evidence of egg predation at many gull colonies surveyed, and it is uncertain how successful breeding was in 1988. Cormorants declined from 245 nesting pairs in 1976/77, to 63 pairs in 1988. Three small colonies disappeared and the major colony on Dugout Rocks decreased from 148 pairs to 18 pairs. This parallels the trend observed in the Queen Charlotte Islands (Rodway 1988). Puffins have not been observed nesting on Wells Rock since 1970, and only three pairs remained on Byers Islands in 1988, where 65 were estimated nesting in 1976. Those sites showed signs of past erosion. Small colonies of storm-petrels on Byers Islands and Fingal island have been abandoned. Mink have reached or been introduced to Goose Island since 1948, and the Pigeon Guillemots, gulls and oystercatchers reported nesting by Guiguet (1953) are no longer present. We suspected the presence of mink on Rachael Islands. The majority of Rhinoceros Auklet burrows there appeared unused, and we found abundant remains of Rhinoceros Auklets throughout colony areas. Increases in population estimates for burrow nesting species cannot be evaluated because of differences in survey techniques.

We saw no evidence of deer on colony islands except on Goose Island. They appeared to be absent from all small, western islands along the northern mainland coast. Mink were plentiful on all islands that did not support nesting seabirds. There were numerous burrows used by mink on most islands where they occurred. Those burrows were similar in size to large Cassin's Auklet or typical Rhinoceros Auklet burrows and could be confused with them if not examined carefully for specific signs.

The following codes have been used on Table MC-1 to indicate the type of population estimates presented. A more detailed definition of these codes can be found in Rodway et al. (in prep).

S: breeding suspected but not directly observed.

x: breeding confirmed but population not estimated.

e: population estimated without systematic sampling or total counts.

t: population estimated from systematic sampling along transects.

26: a number without a code indicates a total count.

E: extinct.

(): number of birds in breeding plumage on or near the colony.

Acronyms for species names follow Campbell and Harcombe (1985; see Appendix I).

Table MC-1. Current summary of breeding seabird populations on the Northern Mainland Coast. Estimates are of breeding pairs for all species except Pigeon Guillemots. To include that species, total populations are given as individual birds. Data codes and sources are explained on previous page.

SITE CODE	SITE NAME	FTSP	LSPE	PECO	BLOY	GWGU	PIGU	CAAU	RHAU	TUPU	HOPU	TOTAL BIRDS	SURVEY YEAR(S)*
MC 010	Zayas I.					1	(3)					5	1976
MC 020	"Dundas" Rks.					7						14	1976
MC 030	Grey I.				2	108	1x					222	1988
MC 040	Green I.				2	248	S(35)					535	1988
MC 050	"Prince Leboo" Rks.					59						118	1976
MC 060	Chearnley It.				1		(6)					8	1976
MC 070	"Baron" Cliffs						x(55)					55	1987
MC 080	Connel Is.				1	0	S(12)		0			14	1987
MC 090	"Simpson" Rks.				1S	178	S(25)					383	1988
MC 100	Lucy Is.				4S	59	S(197)		25300t			50923	1983,88
MC 105	Prince Rupert						3x					6	1976
MC 110	Tree Knob Gp.			22		60	2x(13)					177	1976,88
MC 120	Roland Rks.					88	1x(4)					180	1976,88
MC 130	Rachael Is.				5	25	S(42)		300S			702	1987,88
MC 140	Greentop It.				1S	6	S(12)					26	1979
MC 150	Holland Rk.				1	8	1x(10)					28	1979
MC 160	Gull Rks.					39eS	S(6)					84	1987
MC 170	Lawyer Is.				4	0						8	1987
MC 180	Northwest Rks.				1	36	4x(47)					121	1976
MC 190	North Rk.				1S	27	3x(29)					85	1976
MC 200	Joseph I.				(3)	245	S(75)					565	1988
MC 210	MacDonald I.				(2)	6	S(4)					16	1988
MC 220	"Porter" Rks.					12						24	1988
MC 230	Glide Is.				1	12	S(2)					28	1988
MC 240	Dupont I.	50eS	50eS		3S				0			206	1988
MC 250	Beaven Is.				1							2	1976
MC 260	Anderson Is.				1							2	1976
MC 270	Wells Rks.	0			7	83	4x(19)		0	0(0)		199	1988
MC 280	Isnor Rk.				1	1S	2x(18)					22	1988
MC 290	Moore Is.	8900t	6000t		21e	150	2x(187)	400eS	40500t	3(6)		112135	1988
MC 300	McKenney Is.	1500t	2900t		8e	92	1x(14)	40eS	130eS			9354	1988
MC 310	Whitmore Is.	340t	230t		5	19	x(60)		12400t			26048	1988

cont'd

Table MC 1. (cont'd)

SITE CODE	SITE NAME	FTSP	LSPE	PECO	BLOY	GWGU	PIGU	CAAU	RHAU	TUPU	HOPU	TOTAL BIRDS	SURVEY YEAR(S)*
MC-320	"Lone" Rock				1S	20						42	1988
MC-330	Bowden Is.				0	18						36	1988
MC-340	Byers Is.	E	E		10	112	4x(88)	18800t	37900t	3(6)		113738	1988
MC-350	Sinnett Its.	19200t	11200t		7	93	3x(43)	2100t		1S(1)		65245	1988
MC-360	Conroy I.		75e		7	208	2x(148)	450eS	500eS	10(6)	1S(2)	2650	1988
MC-370	Harvey Is.	100eS	100eS		12	93	2x(24)	940eS	210eS			2934	1988
MC-380	Rogerson Rk.				1	52	2x(6)					112	1988
MC-390	Steele Rk.			0	0	0	(3)					3	1988
MC-400	"Price" Rks.				1	82						166	1988
MC-410	"Limit" Rks.				1S	1	3x(14)					18	1988
MC-420	Fingal I.	E			3	48	2x(25)					127	1988
MC-430	Guano Rks.				0	11	2x(3)					26	1988
MC-440	"Fitzmelon" Rk.					3						6	1988
MC-450	Goose I.				2							4	1988
MC-460	Gosling Rks.				9	83	7x(31)					215	1988
MC-470	Currie It.				3S	32	S(4)					74	1988
MC-480	Mosquito Its.					0						0	1976
MC-490	"Triquet" Rks.				2	1S	1x(3)					9	1988
MC-500	Blenheim I.			17	1S	68	3x(15)					187	1988
MC-510	Airacobra Rk.					6						12	1988
MC-520	N. Pointers			0	0	119	S(8)					246	1988
MC-530	Upward Rk.				2S	29	S(17)					79	1988
MC-540	Major Brown Rk.			0	5	319	S(1)					649	1988
MC-550	Dugout Rks.			18	3	141	2x(9)					333	1988
MC-560	Ruby Rks.			6	3	69	S(28)					184	1988
MC-570	Ann I.						x(40-50)					40	1937
MC-580	Armstrong Rk.				8	8	(4)					36	1976
MC-590	Egg I.				0	2	3x(18)	5S	90e			212	1988
MC-600	Egg Rks.				6e	140	1x(18)					310	1988
	TOTAL NESTING PAIRS	30090	20555	63	159	3327		22735	117330	17	1		
	TOTAL BREEDING BIRDS	60180	41110	126	318	6654	1434	45470	234660	34	2	389988	
	NUMBER OF SITES	6	7	4	41	49	47	7	9	4	1	60	

METHODOLOGICAL CONSIDERATIONS AND RECOMMENDATIONS

The goal of the inventory program was to establish baseline estimates of breeding seabird populations using replicable survey techniques. Total counts conducted at the appropriate time are readily compared. Partial counts are adequate to detect substantial changes in nesting distribution and population on small colonies. Changes in population estimates for large colonies are more difficult to interpret. The level of precision of estimates derived from systematic sampling along transects depends on the precision of three components which enter into their calculation: colony area, burrow density and burrow occupancy rate. Each component has its own sources of error.

On most colonies, there is no measure of error for colony area calculations, and its level of precision is unknown. On Moore and Whitmore islands, we were able to calculate a standard error for Rhinoceros Auklet colony area estimates because we sampled the width of the colony along each strip transect. This standard error, however, indicates the variabilty of the width of the colony only. There is no error estimate for the measurement of the perimeter of the colony. On all colonies, distance, slope and elevation measurements taken along transects help delineate nesting areas, but precise identification of colony boundaries depends on thorough exploration, careful observations and detailed and explicit note-taking. Sources of error arise whenever observations or field notes are not comprehensive enough to allow unequivocal definitions of colony limits. Training of observers in what evidence to look for, and how to record it unambiguously, is an essential element of an inventory program and directly influences the quality of data obtained. Having an experienced corps of surveyors from year to year maintained a consistent standard for defining colony limits. The accuracy of mapping and measuring colony areas also depends on the quality and scale of available maps.

The standard error of the average burrow density has been calculated for each site. The level of precision and accuracy depends on burrow distribution, sampling intensity and appropriate selection of quadrat size and spacing. Compromises were made between the level of precision desired and the time required to obtain that level. Average densities for small colonies often have large standard errors because they were sampled with few plots. Observer bias in identifying burrows may create an unmeasured subjective error. Consistent criteria, experienced observers and mutual consultation minimized discrepancies. Studies are required to evaluate the importance of this bias.

Burrow occupancy rates were obtained for large Cassin's and Rhinoceros auklet colonies. At storm-petrel colonies, we were able to calculate proportions of Fork-tailed Storm-Petrels, but we were too early to obtain accurate information for Leach's Storm-Petrels. Thus, overall occupancy rates for storm-petrels are lacking at all colonies on the Northern Mainland Coast.

Digging alcid burrows to determine occupancy is a laborious and time-consuming task. Often half or more of the attempts are unsuccessful. At the larger auklet colonies where we did determine occupancy rates, it was not feasible to determine the occupancy of burrows within all quadrats, and occupancy was determined at selected locations. At some colonies, occupancy was determined in a single plot and no standard error could be calculated. We recommend not attempting to explore burrows in all quadrats unless more time is spent than on the present surveys. On storm-petrel and Cassin's Auklet colonies in other regions of the coast, we selected quadrats randomly and set a fixed sample size of five burrows at each plot selected (see Rodway et al. 1990 and Rodway and Lemon 1991). This method facilitates statistical analysis and comparison and we recommend it for future surveys. Research on the variation in occupancy rates within and between colonies, and over time, is required to assess and improve sampling methodology (see Gaston and Jones 1984; Gaston and Collins 1988).

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Appendix I. Index to species names and acronyms.

Birds:

Red-throated Loon	*Gavia stellata*	RTLO
Pacific Loon	*G. arctica*	PALO
Common Loon	*G. immer*	COLO
Horned Grebe	*Podiceps auritus*	HOGR
Red-necked Grebe	*P. grisegena*	RNGR
Northern Fulmar	*Fulmaris glacialis*	NOFU
Sooty Shearwater	*Puffinus griseus*	SOSH
Short-tailed Shearwater	*P. tenuirostris*	STSH
Fork-tailed Storm-Petrel	*Oceanodroma furcata*	FTSP
Leach's Storm-Petrel	*O. leucorhoa*	LSPE
Double-crested Cormorant	*Phalacrocorax auritus*	DCCO
Brandt's Cormorant	*P. pencillatus*	BRCO
Pelagic Cormorant	*P. pelagicus*	PECO
Great Blue Heron	*Ardea herodias*	GBHE
Brant	*Branta bernicla*	BRAN
Canada Goose	*Branta canadensis*	CAGO
Green-winged Teal	*Anas crecca*	GWTE
Mallard	*A. platyrhynchos*	MALL
Greater Scaup	*Aythya marila*	GRSC
Harlequin Duck	*Histrionicus histrionicus*	HADU
Surf Scoter	*Melanitta perspicillata*	SUSC
White-winged Scoter	*M. fusca*	WWSC
Common Merganser	*Mergus merganser*	COME
Red-breasted Merganser	*M. serrator*	RBME
Bald Eagle	*Haliaeetus leucocephalus*	BAEA
Sharp-shinned Hawk	*Accipiter striatus*	SSHA
Rough-legged Hawk	*Buteo lagopus*	RLHA
Peregrine Falcon	*Falco peregrinus*	PEFA
Sandhill Crane	*Grus canadensis*	SACR
Black-bellied Plover	*Pluvialis squatarola*	BBPL
Semipalmated Plover	*Charadrius semipalmatus*	SEPL
Black Oystercatcher	*Haematopus bachmani*	BLOY
Greater Yellowlegs	*Tringa melanoleuca*	GRYE
Wandering Tattler	*Heteroscelus incanus*	WATA
Spotted Sandpiper	*Actitis macularia*	SPOT
Whimbrel	*Numenius phaeopus*	WHIM
Ruddy Turnstone	*Arenaria interpres*	RUTU
Black Turnstone	*A. melanocephala*	BLTU
Surfbird	*Aphriza virgata*	SURF
Red Knot	*Calidris canutus*	REKN
Semipalmated Sandpiper	*C. pusilla*	SESA
Western Sandpiper	*C. mauri*	WESA
Least Sandpiper	*C. minutilla*	LESA
Long-billed Dowitcher	*Limnodromus scolopaceus*	LBDO
Red-necked Phalarope	*Phalaropus lobatus*	RNPH
Parasitic Jaeger	*Stercorarius parasiticus*	PAJA
Franklin's Gull	*Larus pipixcan*	FRGU
Mew Gull	*L. canus*	MEGU
Ring-billed Gull	*L. delawarensis*	RGGU
California Gull	*L. californicus*	CAGU
Herring Gull	*L. argentatus*	HEGU
Western Gull	*L. occidentalis*	WEGU

Appendix I (cont'd)

Glaucous-winged Gull	*L. glaucescens*	GWGU
Black-legged Kittiwake	*Rissa tridactyla*	BLKI
Caspian Tern	*Sterna caspia*	CATE
Common Murre	*Uria aalge*	COMU
Pigeon Guillemot	*Cepphus columba*	PIGU
Marbled Murrelet	*Brachyramphus marmoratus*	MAMU
Ancient Murrelet	*Synthliboramphus antiquus*	ANMU
Cassin's Auklet	*Ptychoramphus aleuticus*	CAAU
Rhinoceros Auklet	*Cerorhinca monocerata*	RHAU
Tufted Puffin	*Fratercula cirrhata*	TUPU
Horned Puffin	*F. corniculata*	HOPU
Northern Saw-whet Owl	*Aegolius acadicus*	NSWO
Rufous Hummingbird	*Selasphorus rufus*	RUHU
Belted Kingfisher	*Ceryle alcyon*	BEKI
Red-breasted Sapsucker	*Sphyrapicus ruber*	RBSA
Hairy Woodpecker	*Picoides villosus*	HAWO
Northern Flicker	*Colaptes auratus*	NOFL
Olive-sided Flycatcher	*Contopus borealis*	OSFL
Western Flycatcher	*Empidonax difficilis*	WEFL
Tree Swallow	*Tachycineta bicolor*	TRSW
Barn Swallow	*Hirundo rustica*	BASW
Northwestern Crow	*Corvus caurinus*	NWCR
Common Raven	*C. corax*	CORA
Chestnut-backed Chickadee	*Parus rufescens*	CBCH
Red-breasted Nuthatch	*Sitta canadensis*	RBNU
Brown Creeper	*Certhia americana*	BRCR
Winter Wren	*Troglodytes troglodytes*	WIWR
Golden-crowned Kinglet	*Regulus satrapa*	GCKI
Ruby-crowned Kinglet	*R. calendula*	RCKI
Swainson's Thrush	*Catharus ustulatus*	SWTH
Hermit Thrush	*C. guttatus*	HETH
American Robin	*Turdus migratorius*	AMRO
Varied Thrush	*Ixoreus naevius*	VATH
European Starling	*Sturnus vulgaris*	EUST
Orange-crowned Warbler	*Vermivora celata*	OCWA
Yellow Warbler	*Dendroica petechia*	YEWA
Yellow-rumped Warbler	*D. coronata*	YRWA
Townsend's Warbler	*D. townsendi*	TOWA
Wilson's Warbler	*Wilsonia pusilla*	WIWA
Savannah Sparrow	*Passerculus sandwichensis*	SAVS
Fox Sparrow	*Passerella iliaca*	FOSP
Song Sparrow	*Melospiza melodia*	SOSP
Golden-crowned Sparrow	*Zonotrichia atricapilla*	GCSP
Dark-eyed Junco	*Junco hyemalis*	DEJU
Red Crossbill	*Loxia curvirostra*	RECR
Pine Siskin	*Carduelis pinus*	PISI
Evening Grosbeak	*Coccothraustes vespertinus*	EVGR

Appendix I (cont'd)

Mammals:

Red Squirrel	*Tamiasciurus hudsonicus*	TAHU
Deer Mouse	*Peromyscus maniculatus*	PEMA
Northern Sea Lion	*Eumetopias jubatus*	EUJU
River Otter	*Lutra canadensis*	LUCA
Sea Otter	*Enhydra lutris*	ENLU
Harbour Seal	*Phoca vitulina*	PHVT
Pacific White-sided Dolphin	*Lagenorhynchus obliquidens*	LAOB
Killer Whale	*Orcinus orca*	OROR
Dall's Porpoise	*Phocoenoides dalli*	PHDA
Gray Whale	*Eschrichtius robustus*	ESRO
Sitka Deer	*Odocoileus lemionus*	ODHE